Japanese Knotweed

as an alternative material

Beata Salonen Ripa

Degree Project for Bachelor of Fine Arts in Design
Main field of study Industrial Design
From Lund University School of Industrial Design, Department of Design Sciences

Examiner: Professor Claus-Christian Eckhardt
Supervisors: Senior Lecturer Charlotte Sjödell
Senior Lecture Jasjit Singh
Lecture Anna Persson

Contributors:
Cecilia Palmér, postgraduate Swedish University of Agricultural Sciences
Dr. Peter Fitzsimons Technical Manager, Invasive Weeds Unit, Property Care Association

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ABSTRACT

Japanese knotweed, or Parkslide in Swedish, is considered one of the world's most invasive species. The aim of this project was to explore and investigate the possibility of utilizing this alternative material, and by doing so, help restrict and limit the expansion of the plant.

Japanese knotweed was used in a number of ways to test the capability of the material. Experts in the field of invasive species were consulted on the risks of using an invasive plant, and the possibilities of using it in a commercial way were discussed.

The result is a conceptual table piece made of the stems, as well as a more realistic example of use, being a filler material for table tops. Using the stems in a vertical way between thinner sheets minimizes material use and weight of the furniture.

I hope the project will help give a more open view towards alternative materials and raise awareness of invasive species.

TIMELINE

BRIEF IDEAS	4th Feb Individual crit
IDEA SET	9th Feb knotweed collection
RESEARCH	25th Feb contact with Cecilia Palmér
	11th Mars contact with Peter Fitzsimons
BRIEF	11-23th Mars experimenting
IDEATION + EXPERIMENTATION	24th Mars Kick-off presentation
	25th Mars - 11th April prototyping
	12th April documentation draft
REALISATION	13-20th April building final mockup
	20-25th April last fix, photos and documentaion
PRESENTATION + DOCUMENTATION	26-27th April Final Presentation

BACKGROUND

When I first started my education as an industrial designer at Lund University, one of the first things we were told was that we are now entering a profession completely based on - and dependent on - consumption, one of the biggest environmental problems in the world. Many of us nodded, and the ethical aspects of being an industrial designer became a big discussion that afternoon.

I have continued to think about this, especially in periods when I'm reminded of environmental problems and my anxiety about this increases. I try to always include ethics and environment in my projects and this happened to become the focus of my bachelor's thesis when I chose to work with Japanese knotweed - a very invasive plant.

The goal for the project is not only to make a product with as little negative impact on the environment as possible, but to do something actively good for the environment. Utilizing Japanese knotweed commercially could besides being beneficial material wise also help limit the expansion of the plant.

Japanese Knotweet

Japanese knotweed has many names, among them *Reynoutria japonica, Fallopia japonica* and *Polygonum cuspidatum.* It can be found in large parts of the world but is native to East Asia and is considered one of the world's most invasive species (Naturvårdsverket 2020).

The root system is very invasive and can damage concrete foundations, buildings, and pavings. It can also reduce the capacity of channels in flood defences to carry water. The stems are hollow with distinct raised nodes, similar to bamboo, though they are not related.

Another reason for the success of the species is its tolerance of a very wide range of soil types, pH and salinity. Its rhizomes can survive temperatures of –35 °C and can grow up to 7 metres horizontally and 3 metres deep. This makes removal extremely difficult. The plant is also resilient to cutting, and easily resprouts from the roots.

"It's like a lame, weak version of bamboo"

Beata S. Ripa

How is the plant used today?

Knotweed has been used in traditional Chinese Medicine and according to Jiri Patocka, Zdenka Navratilova and Maribel Ovando (2017) there are many studies that show the usefulness of knotweed in human health, although most of them are tested only on laboratory animals. It can be eaten in similar ways to rhubarb and is also partially used in the cosmetics industry as an anti-wrinkle agent.

How and where in the world that extraction is made however was very hard to find and the companies I reached out to about this did not respond.

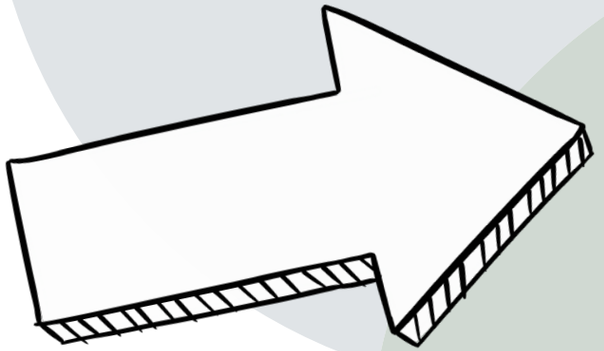
BRIEF

To design a commercial product using japanese knotweed.

The aim is to restrict/eliminate colonies by utilizing the plant.

Experimenting
What can I do with this material?
How do I make it look good?
How do I assemble it?

Researching
How do I handle this plant?
What are other people doing with it?
Could it be used in a commercial way?



My project

“Green Thinking”
What is the most environmentally friendly way to do it?

Research

what do the professionals say?

Utilizing an invasive plant and reducing its spread at the same time is tempting, but can also be problematic. One of the biggest risks with Japanese knotweed lies in the handeling of the plant.

Therefore I got in contact with two experts in the field of invasive species, Cecilia Palmér and Peter Fitzsimson to get some more information.

Cecilia Palmér
postgraduate, Swedish University
of Agricultural Sciences

Dr. Peter Fitzsimons
Technical Manager, Invasive Weeds Unit
Property Care Association UK

Both Palmer and Dr. Fitzsimons explained to me that the danger with knotweed lies with the root fragments, and especially the roots from new plants. Root fragments as small as less than a gram can give rise to new populations. If the stems are cut approximately 10cm from the ground however, they can be moved without any risks. The hard, whitered stems I've been using can also be moved without any risk.

When discussing the possibility of handling the plant in a commercial way however, it's been hard to come to any conclusions. Dr. Fitzsimons told me that using japanese knotweed as a raw material in the UK would be problematic because of environmental regulations. Since we don't have any regulations regarding this in Sweden yet, I wanted to know more.

Dr. Fitzsimons couldn't really elaborate on the subject, so I contacted two companies specialising in removal of Japanese knotweed asking about their routines and what kind of regulations they need to follow when handling the plant. Unfortunately, neither one of the two companies I reached out to responded. Insted, I read their websites and came to some conclusions myself.

The Irish based company called The Japanese Knotweed Company specialising in removal of the plant and describes seven ways to remove it. The methods uses different variations of

- herbicide spraying
- physically removale of the plant
- restricting with non –permeable barriers
- stem injection with herbicide

Conclusion

Several of these methods would be compatible with harvesting the hard stems in the wintertime and then removing, injecting, spraying or restricting the plant in the spring and summer to prevent further growth of the plant.

Röstånga, Sweden

Where is knotweed found?

In Sweden you can find knotweed all the way up to the region Dalarna.

It grows in cities, in gardens and in the countryside.

I found material for my project at my parents house. The knotweed has been growing here ever since I was little. I got the idea for the project when helping my mother get rid of it.

THE GREEN **CHECKLIST**

What to think about when designing “sustainable”

- Compoud materials - No thanks!
- Avoid high energy cost materials such as metal and glass

or

- Use long lasting materials such as metal or glass, which can be more eco friendly in the long term
- Fewer materials = better
- Can the materials be completely separated? Beneficial when recycling!

Experiments

What can you do with the material?

- Boiling stems and reshaping them
- Mixing fibres and creating a mass
- Mixing and reshaping inner foam-like fibre

Mixing the white, inner fibre, adding water and letting it dry. It reshaped the fibre, but the material was very crumbly and fragile

Too fragile

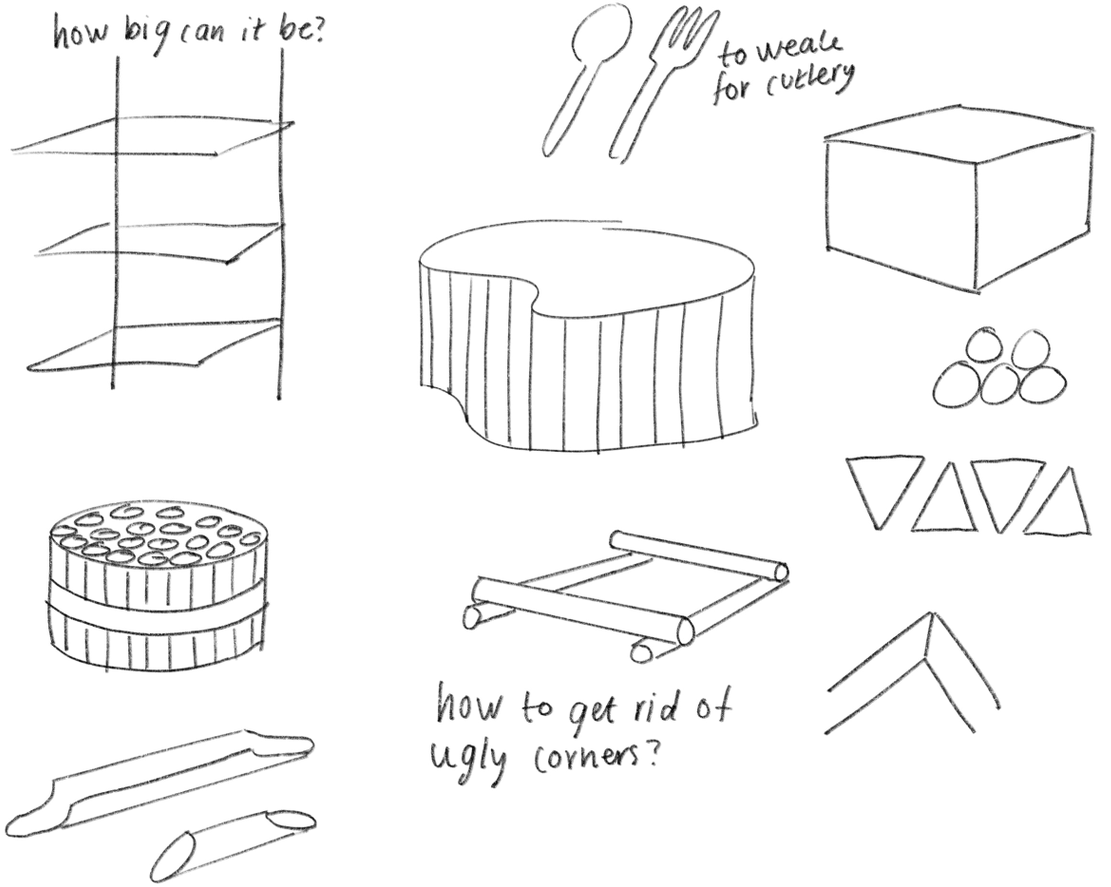
Mixing the stems, boiling the mixture and letting it dry. Created a thin, chip-board-like material. Might work with proper tools/machines.

Too fragile

Limited flexibility after boiling. Cut-ting stems in angels and gluing them together. Hard to glue due to limited contact area.

Too fragile + hard to glue

After the experiments I decided to build something where I keep the stems more intact. I sat down and tried to figure out different ways to use the stems. I started to think about how I could create surfaces, to maybe build some kind of furniture.

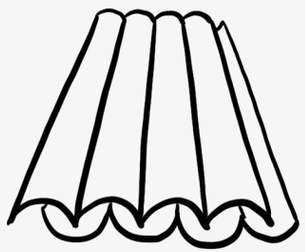


Creating surfaces

Idea 1

Cutting stems in halves and joining them. Very hard due to the irregularities of the stems. Not enough surface area

= too fragile method

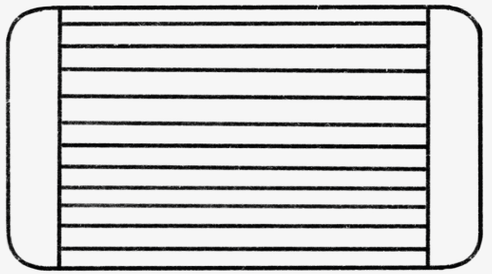


Creating surfaces

Idea 2

Whole stems, joined by end pieces. Some irregularities but sturdy. Too irregular to make full scale.

= too irregular method

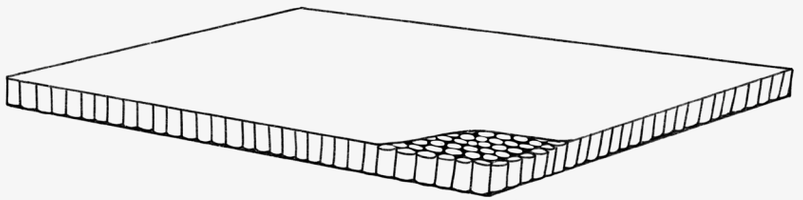


Creating surfaces

The “sandwich method”

Small pieces of stems stacked vertically between two pieces of cardboard. Very strong and similar to what e.g Ikea does with cardboard in their coffee table tops.

This idea led to the decision to make some kind of table using the “sandwich method”.



I ♥ VERTICAL

How to build a table

step 1 . top 

step 2. legs 

Intersecting

How to attach legs and support

Hollow, round stems - glue and screws not effective.

Can you intersect with rope or thread? (Removable, no compound material)

Can thread be used as a finish, or to strengthen the stems?

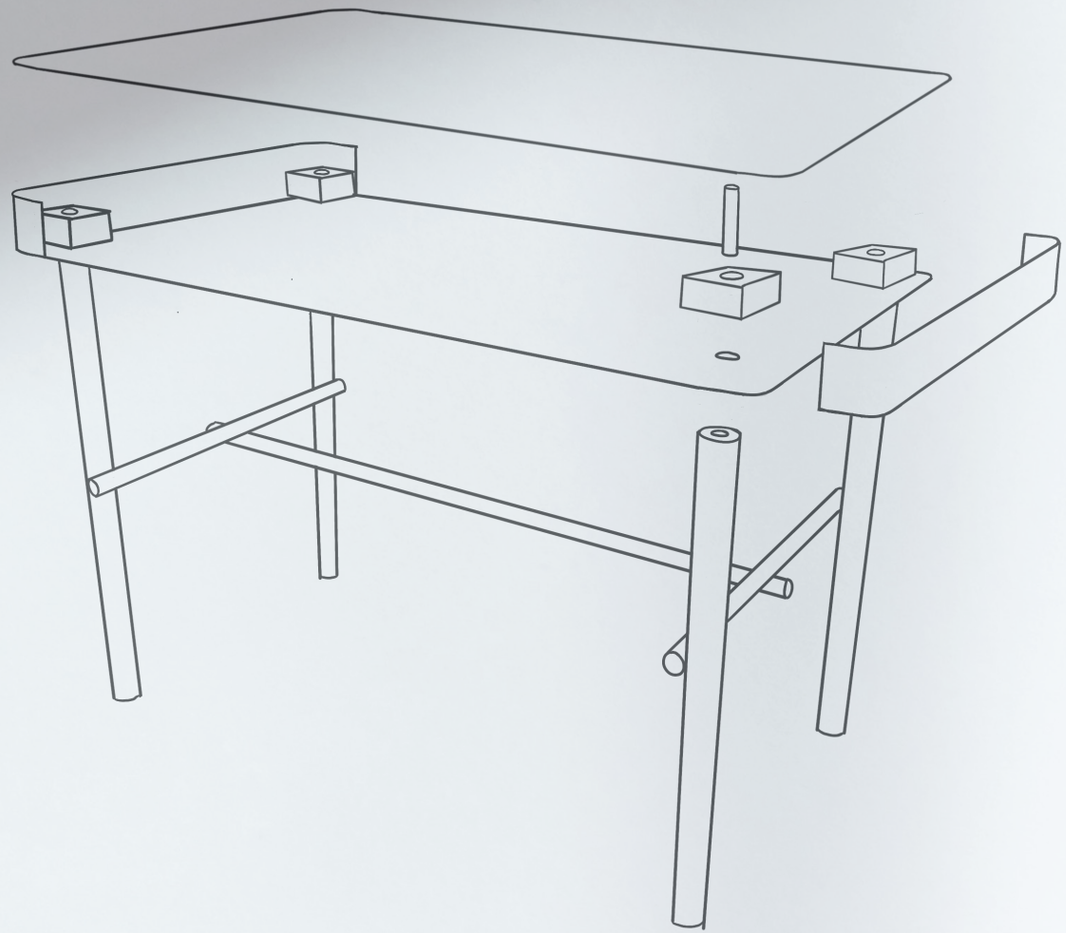
Intersecting

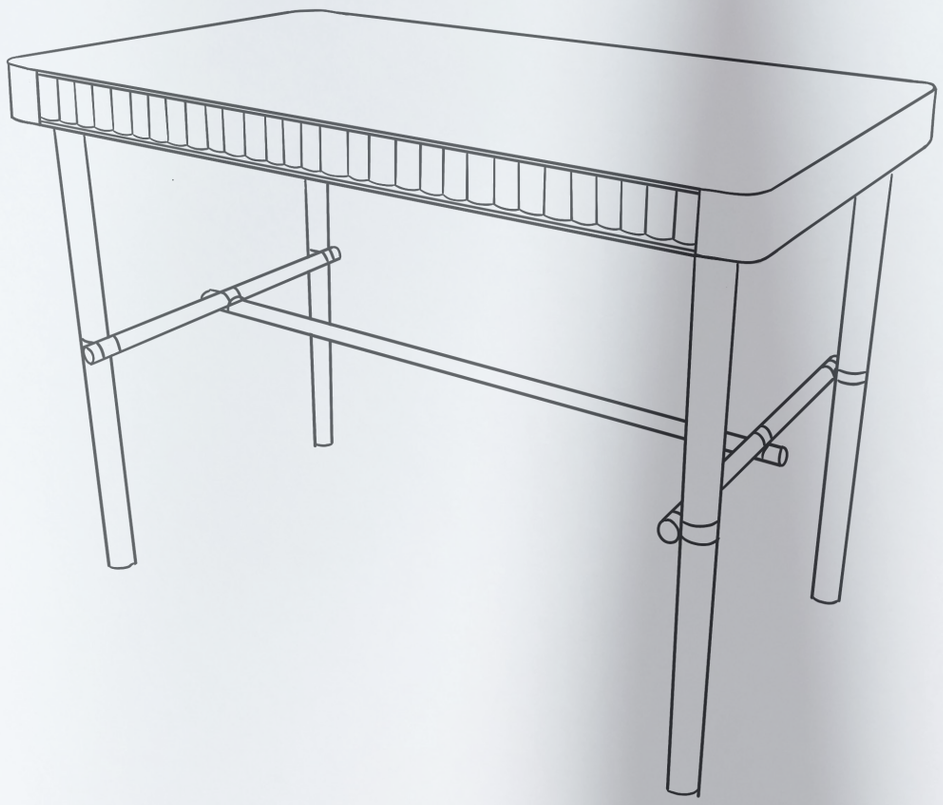
How to attach legs and support

Is lashing strong enough? - yes

Figuring how to intersect, and where.

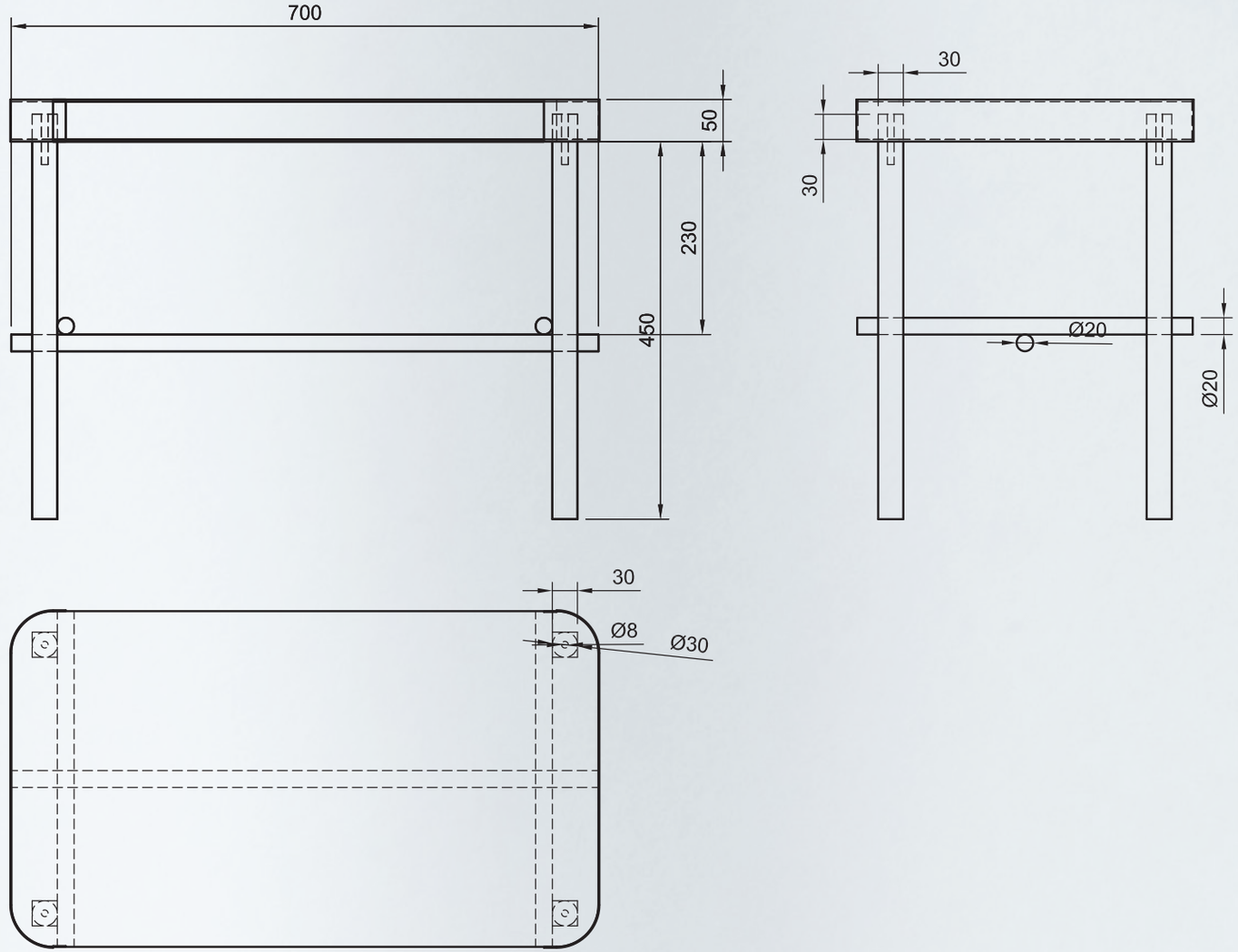
Final sketch





“Technical drawing”

(Naturally grown sticks tend to not follow exact measurements)



Materials

masonite

cotton thread

wooden plug

wood glue

thin cardboard

Japanese knotweed

The process during a pandemic

Making a bachelor project during a pandemic is a bit tricky. I hesitated mentioning it in this documentation, but came to the conclusion that it's something worth taking in account when reviewing this process.

The pandemic led to the school closing and its students not being able to use the facilities and workshops, which of course made building things more difficult. It also led to difficulties buying material, and input from teachers and fellow students was not a matter of course anymore.

However, I think this resulted in a mind set of problem solving I wouldn't have gotten elsewhere.

The process 1. Sawing in your bedroom

This means accepting everything will be a bit wonky.

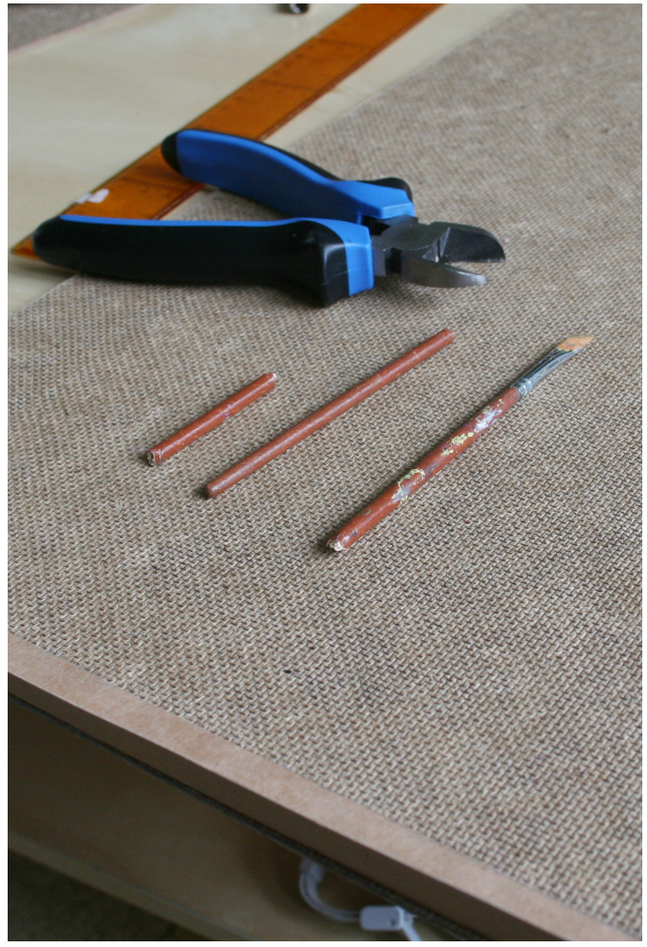
The process

2. Lack of tools and materials

Using old brushes as wooden plug

and

Cutting round corners with pliers when lacking proper saws



The process

3. Legs - height and attachement

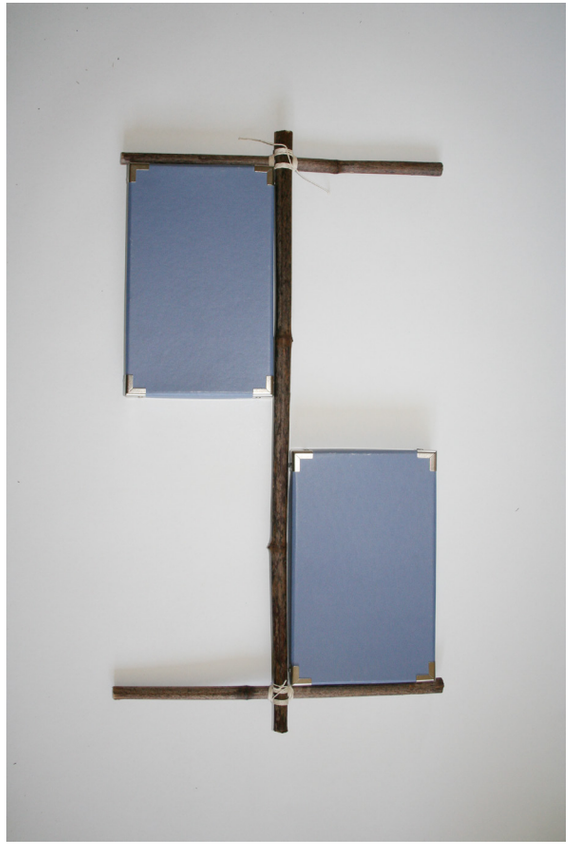
Deciding on height

Adding plug to the stems

Drilling hole for small plug

The process 4. Making the support

Using lids as set square



Practicing square lashing

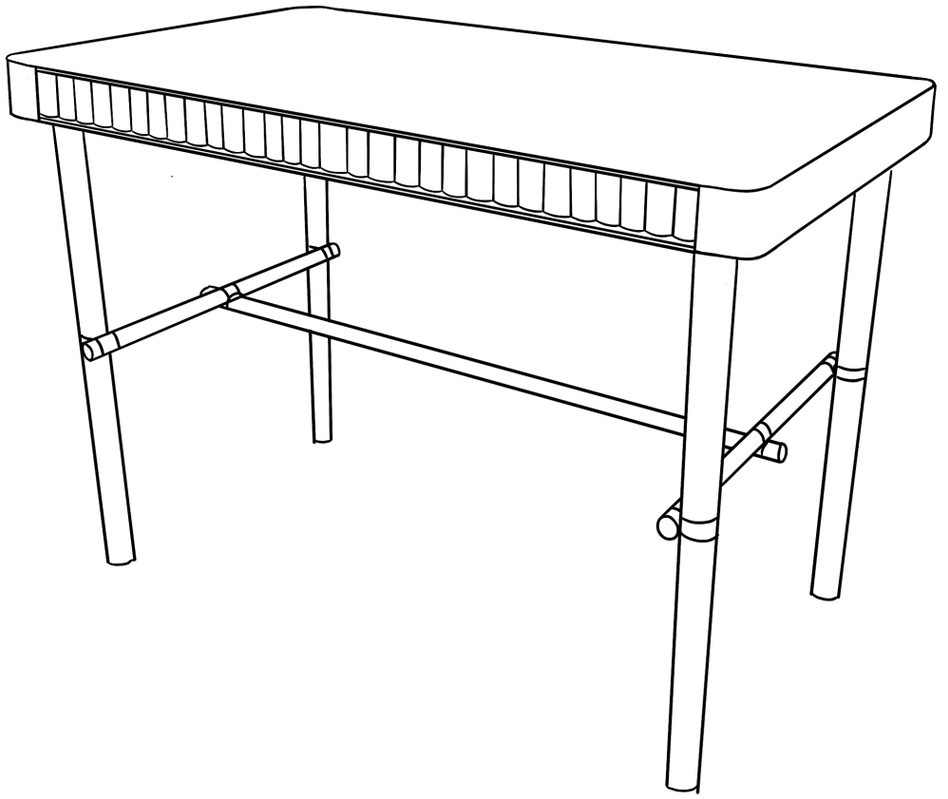
The process 5. The tabletop

Extra flaps to attach sides later on

Deciding on thickness

Sawing a ridiculous amount of stem pieces (the outermost row glued)

Material analysis



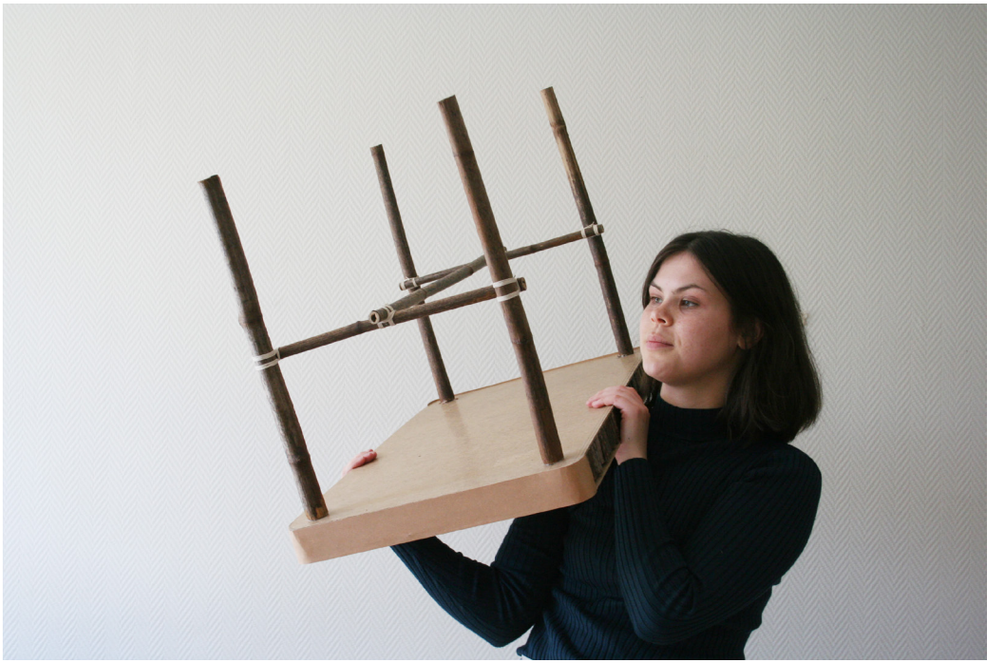
Overview
I wanted to show off my material and chose to build as much of the table as possible out of the Japanese knotweed. I also left the sides of the tabletop open, to show the material used inside.

Using the knotweed and its natural irregularities as table legs was tricky. However, using smaller pieces for the tabletop really did work well. This is why I see the table as more of a conceptual piece, while the method used in the tabletop has a realistic potential to be used in a commercial way.

Board material
I went with the cheapest and thinnest board I found, a 2.5mm thick masonite board. My point with this material selection is that you need very little of it, and you could use any kind of wood.

Glue and thread
I wanted to use as little glue as possible, to be able to sort the material after the product has been discarded. Thread can easily be removed and that’s why I chose to use this to fasten the leg support.

Very little glue was used in the tabletop, and if the process would be industrialized and proper machines used to press the board and knotweed pieces together, even less glue would be needed.



Summary

I see the result as a conceptual piece made of Japanese knotweed as well as a more realistic example of its use, being the sandwich method used for tabletops.

However, my intent with this project was to provide an honest evaluation of the ability and feasibility of projects using experimental materials. Even though a proper use of the material and a safe harvesting seems possible, the process of collecting it and the utilizing of the plant would need to imply an evident environmental gain to be beneficial. This was something Cecilia Palmér also brought up.

"As you're often required to drive around to get to the different colonies, one might discuss the environmental impact of this in relation to the problems that the plant causes. Maybe this is relevant when discussing using it in a commercial way as well"

Cecilia Palmér

Calculating this ended up being very hard. Investigating the energy of the harvest process, emissions and possible gains of using the Japanese knotweed is something I've not been able to do.

This is one of the bigger problems and uncertainties of this project, the claim for it to be environmentally friendly. I think there are many projects labeling themselves as green or environmentally friendly without really accounting for it, leading to the big problem of "greenwashing".

My honest evaluation of the possibility of using japanese knotweed in a commercial way ended up being 'plausible'. I still hope the project will help give a more open view towards alternative materials and maybe I can revisit and properly prove or discard this thesis later on, or encourage somebody reading this to do just that.

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