**The Dream:**

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**“I’m a tree!” (working title)**

A video game of being a plant and all its glory. Control processes of plant growth and defense.

Start out as an plant seed build/grow into a full tree while trying to survive pests, pathogens, droughts, and flood with your friends!

**Gameplay**

* Collect resources nitrogen, phosphorus, water, sunlight, and CO2
* From simple metabolites, build your plant from various tissues and cell types.
* Survive waves of insect pests, plant pathogens, and bad weather.
* Grow big and produce lots of seeds/fruit!

**Tags:** tower defense, educational, resource management, multiplayer, 2D, indie, online co-op,

**Graphics style/art?:** Pixel/8 or 32 bit or cartoon.

Cost? Free? With adds? That go to charity? Grad students? Research?

Platform: Computer/ Steam?   
Online: Severs?

Developers: Carnegie institution for science, and others.

Multiplayer: 1-4, or 1-8 ppl.

Ages 12+ or rated E for everyone? Everyone is the target audience, but really the core video game playing demographics, ages 10-45? Maybe a simpler game if targeted to younger people.

**Actions**

As you continuously gain resources you can grow!

Grow larger, (need some mechanic to work out spacing and growth restrictions).

Building and converting resources into tissues, plant organs, defense compounds.

How would this look like on a screen?

Root level: Maneuver around rocks, avoid pollutants in the soil? Herbicides from drift?

**Growing/plant parts of some dicotyledonous plant**

Indeterminate growth! Control where and how you want to grow your roots, stems, leaves etc.

Molecular plant info

Meristems and auxiliary meristems.

Controlled by the plant hormones Auxin and Cytokinin.

Tissue level detail. All of these should have some kind of nutrient costs.

Seed/Cotyledons

Starts off with basic amounts of resources.

(later seeds fall to the ground or are dispersed by wind or collected)

Stem/Wood,

Xylem, water and mineral transport.

Phloem, sugar transport

Bark/wood. Protection and support after reaction certain heights.

Leaves

Chloroplasts photosynthesis

Stomata/ABA for CO2 fixation. Controlling stomatal closure?

RUBISCO. Lots of N cost.

Use ABA to cut off leaves?

Floral organs. Obtainable after reaching a certain biomass or time? Needed for Pollinators attraction, (bees, butterflies, etc). If you have these things, get pollinated!

Sepals and petals Pistil and Stamen

Nectar/Scent (volatiles) terpenes.

Fruit/seeds

More sugar and cellulose more fruit.

Perhaps higher Nitrogen cost for seeds.

Roots

Nutrient and water? Storage?

Upgrades/probably too detailed for this game: Tubers, aerenchyma, leaf shapes, root hairs, super suberin, cuticle, extra floral nectaries, nitrogen fixers, AMF, root hairs, (Schlerid, aerenchma, parenchyma.) modifications to cell type?

**Gather nutrients**

You are continuously taking in resources with roots and leaves. They add up using some kind of counter. Grow more roots and leaves to get more resources.

Leaves resources

**CO2** (through stomates/rubisco activity) make sugars, (ATP as currency for lots of things?).

**Sun** needed for photosynthesis an get too much (photobleaching).

(photosystems I and II),

Root resources

**(Could do all 19 necessary elements)**

**Water** – must maintain a certain level of hydration/turgor pressure, need it as a currency for photosynthesis and other processes. Don’t get too much or you’re flooded. Indicated by a meter.

**Nitrogen**/**nitrates**: found in pockets of soil. Needed for protein building, and various other things.

**Phosphorus/Phosphates:** found in pockets of soil **N**eed it for growth, certain specialized metabolites, enzymes. make ATP?

**Intermediate resources**

Sugar, basic material/energy convert

Cellulose/lignin, needed for xylem and phloem formation. Or general growth.

Fruit.

Proteins/Enzymes

RUBISCO – needed for photosynthesis/leaves

Various synthases?

Cellulose synthase

Kinase for ATP reactions?

Hormones

Auxin

ABA,

Cytokinins

Specialized/Metabolites volatiles

Defense compounds

Symbiotic ‘lures’,

volatiles for pollinator attraction,

chemicals for plant microbe interactions.

**Enemies. Waves start, likely continuously**

Have you built up enough resources/plant tissue/ defenses for these biotic and abiotic stresses.

**ABIOTIC**

**Drought** - close your stomatas. Make more roots, like towards wet zones. Or go deeper, or shallower.

**Cold** - build up sugars into your stems so you don’t freeze, or can deplete your leaves?

**Sun/shade.** (clouds, probably not other plants or physical structures). Get taller to get more sunlight.

**Flood?** – SUB1 genes, etc.

**Heat** - heat responsive genes…..

**BIOTIC**

(could be plant/level dependent) or based off of real-world pathogens.

**Pathogens ,** usually blown in by the wind, sometimes carried by insects.

‘Potato’ blight

Agrobacterium

Rust

Mildew

**PESTS**

Aphids

Apple maggot

Leaf hopper

Stink bug

Beetles

Cateripllars/ worms

Mites

‘Critters’ Rabbits, squirrels, big boss like creatures,

Root damage, stem damage.

Pathogens (level dependent)?

**Defense**

Classes of specialized metabolites

1

2

3

R genes?

Plant structure/cellulose/lignins.

Trichomes/ secretory trichomes.

Beneficial insects

Parasitoid wasps

Pollinators

**How to win**

Grow into a big, old, tree and produce as much seed/fruit you can without dying.

**Randomly Interspersed with plant facts (like during loading)**

**Background Music?**

**Other plant games**/ literature review?

We need a plant game to reach out to people. And it would be fun to play.

Plants vs zombies

Pikmin

Farmville,

Photosynthesis (board game)

Notes deleted things

**Maps? Probably just do one for now. OR a fictional plant. Apple tree.? Sunflower is runner up. OR maybe not a tree because size/scaling issues?**

Apple tree or Tomato plant or other fruit. Make yummy fruit .

Corn, wheat.

Most grown crop in the US

Arabidopsis

Teach people about the model plant

Soy

Nitrogen fixing

Carnivorous,

Eating bugs, and yes setting seeds.

Sequoia,

Get really tall.

Make yummy fruit.

Sunflower

Straight forward plant design, minimal branching,

Other interesting plants: Maple, Evergreen, Field Pennycress, an extinct plant?

Goals and game play for each level would vary silightly by plant, Try to set seed, more seed is better. varies by level/plant.

Something about GMOs?

**Spore**

Tiny appleseed on the ground, start to sprout, grow your roots and leaves.

Days or years pass

Maybe not care about night time processes?