

MARS BOTANICAL COLONIZATION PLAN

Post-Hex Impact: Strategic Atmospheric Transformation (Year 100+)

1. Habitability & Farming Context

Environmental State: 145 mbar pressure, +15°C mean temp, 85% CO₂, 5.1% O₂.

Key Benefit: Pressure is above the Armstrong Limit; liquid water is stable.

Key Challenge: High CO₂ toxicity for humans and high UV-index due to thin ozone.

The hex-impact scenario provides the heat and gas required for life. However, to make Mars "Earth-like," we must engage in **Biological Atmospheric Scrubbing**. Plants will serve as the primary machines to convert toxic CO₂ into breathable O₂ and solid biomass.

2. Recommended Species for Atmospheric Enrichment

Category	Recommended Species	Atmospheric Role
Aquatic Pioneers	<i>Arthrospira platensis</i> (Spirulina), <i>Prochlorococcus</i>	Oxygen production in the new "Oceanus Borealis." These cyanobacteria produce 50% of Earth's O ₂ and will thrive in the mineral-rich Martian seas.
Soil Builders	<i>Alnus viridis</i> (Green Alder), <i>Trifolium repens</i> (Clover)	Nitrogen fixation. They convert atmospheric N ₂ into soil nitrates, essential for supporting more complex "Earth-style" crops.

Category	Recommended Species	Atmospheric Role
CO₂ Scrubbers	<i>Bambusoideae</i> (Giant Bamboo), <i>Miscanthus x giganteus</i>	Rapid biomass accumulation. These C4 plants process CO ₂ at ultra-high speeds, "locking" carbon into their stalks.
Radiation Shielders	<i>Syntrichia caninervis</i> (Desert Moss)	Creating the first green carpet. Mosses protect the soil from UV and hold moisture in the low-pressure air.

3. Farming for Habitability

The "Hoop House" Strategy

While the atmosphere is "temperate," 85% CO₂ will kill most food crops. Farmers should use simple, non-pressurized transparent poly-tunnels. These "Hoop Houses" allow for:

- **O₂ Enrichment:** Keeping O₂ at 21% locally while utilizing external CO₂ for growth.
- **Humidity Control:** Mars' low pressure (145 mbar) causes high evaporation; tunnels recycle water.
- **Crop Selection:** *Solanum tuberosum* (Potato) and *Ipomoea batatas* (Sweet Potato) are ideal for Martian soil due to their high caloric density and tolerance for varying soil quality.

4. The Earth-Shifting Timeline

Transitioning to an Earth-equivalent atmosphere requires centuries of biological labor:

- **Years 100-200:** Global seeding of oceans with algae. Oxygen rises from 5% to 8%.
- **Years 200-500:** Massive Conifer reforestation (Siberian Larch/Black Spruce). CO₂ levels drop significantly as forests "consume" the air.

- **Year 1,000:** Atmospheric pressure stabilizes; CO₂ is reduced to <10%. Oxygen levels reach ~18%. Mars becomes "Breathable" for humans with simple filtration masks.

Generated by Mars Planetary Engineering Division - Bio-Terraforming Unit