With plants

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A New Image for the Water Hyacinth

In tropical and subtropical areas where water hyacinths grow, including the southern United States, these aquatic plants are generally considered a colossal nuisance. They are extra-ordinarily prolific, virtually indestructible, and their rapid growth clogs rivers and streams.

However, in a small but growing number of American communities, the glossy green, violet-flowered water hyacinth is developing a new image as a useful and beneficial plant. Its upgraded status stemmed from the discovery – in a NASA technology application project – that water hyacinths thrive on sewage; they absorb and digest wastewater pollutants, converting sewage effluents to relatively clean water. Thus, the plants have exciting promise as a natural water purification system, which can be established at a fraction of the cost of a conventional sewage treatment facility. Water hyacinths are serving that purpose in several locales and a number of other communities are considering adoption of the technique.

For maximum effectiveness, pollution-gorged water hyacinths must be harvested at intervals, but this apparent drawback offers potential for additional benefit. Harvested plants can be– and are being – used as fertilizer. They can also be heat-treated to produce consumer energy in the form of methane gas. And if an economical way of drying the plants can be developed, they may find further utility as high-protein animal feed.

Pasted from <http://technology.ssc.nasa.gov/suc_stennis_water.html>

• Water purification. Water hyacinth can be used to aid the process of water purification either for drinking water or for liquid effluent from sewage systems. In a drinking water treatment plant water hyacinth have been used as part of the pretreatment purification step. Clean, healthy plants have been incorporated into water clarifiers and help with the removal of small flocs that remain after initial coagulation and floc removal or settling. (Haider 1989). The result is a significant decrease in turbidity due to the removal of flocs and also slight reduction in organic matter in the water.

In sewage systems, the root structures of water hyacinth (and other aquatic plants) provide a suitable environment for aerobic bacteria to function. Aerobic bacteria feed on nutrients and produce inorganic compounds which in turn provide food for the plants. The plants grow quickly and can be harvested to provide rich and valuable compost. Water hyacinth has also been used for the removal or reduction of nutrients, heavy metals, organic compounds and pathogens from water (Gopal 1987).
Figure 4: Sewage system using water hyacinth
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Fertilisers. Water hyacinth can be used on the land either as a green manure or as compost. As a green manure it can be either ploughed into the ground or used as a mulch. The plant is ideal for composting. After removing the plant from the water it can be left to dry for a few days before being mixed with ash, soil and some animal manure. Microbial decomposition breaks down the fats, lipids, proteins, sugars and starches. The mixture can be left in piles to compost, the warmer climate of tropical countries accelerating the process and producing a rich pathogen free compost which can be applied directly to the soil. The compost increases soil fertility and crop yield and generally improves the quality of the soil.
Compost can be made on a large or small scale and is well suited to labour intensive, low capital production. In developing countries where mineral fertiliser is expensive, it is an elegant solution to the problem of water hyacinth proliferation and also poor soil quality. In Sri Lanka water hyacinth is mixed with organic municipal waste, ash and soil, composted and sold to local farmers and market gardeners.

http://www.itdg.org.pe/fichastecnicas/pdf/Water%20hyacinth.pdf

Water hyacinth is often sold for use in ornamental ponds. It can also be used as a component of animal feeds and for natural agricultural fertilization. It has recently been found to absorb a variety of toxins and heavy metals and has come into use for water purification. Water hyacinth is prohibited in Texas, and although exemptions for use in water purification have been incorporated into the Texas Parks & Wildlife regulations, exemptions are not likely to be granted for ornamental ponds.

Aquatic Plants
Processes of water purification in a facultative (both anaerobic and aerobic bacteria) waste water pond: ... Aquatic plants also treat the water

Water hyacinth (Eichhornia crassipes) and duckweed (Lemna spp.) effectively remove nutrients and organics from water through their aquatic root systems. According to Roger and Davis (1972) the nitrogen and phosphorus wastes of over 800 people could be removed by one hectare of water hyacinth. Water hyacinth are expert nutrient absorbers, because they absorb more of a nutrient than they need for growth. Harvesting the water hyacinth then removes these nutrients from the pond system. To complete the cycle, the harvested plant matter could potentially be used as a soil enhancer, a livestock feed, or a human food. Water hyacinth grows year round and duckweed flourishes in the winter months. (Wolverton and McDonald 1978) NASA booklet
Disadvantages of using aquatic plants in waste water treatment ponds:

Floating aquatic plants provide waste water treatment, but they change the dynamics of a facultative pond that has algae as the only oxygen producer. In a facultative pond, there is an aerated surface layer that sits on top of an anaerobic layer. The top layer is naturally aerated by the diffusion of oxygen from the atmosphere and from the oxygen release of algae. When floating aquatic plants are placed on top of this system, they release oxygen above the surface of the water and block the diffusion of oxygen from the atmosphere. As a result, ponds with floating aquatic plants are oxygen deficient and the aerobic zone in the pond is found only near the plant roots. (Kadlec and Knight, 1996) Consequently when a pond is completely covered with water hyacinth that are photosynthetically inactive and there is high oxygen demand in the pond, mechanical aeration may be needed to keep the anaerobic bacterial population under control (Wolverton and McDonald 1978) Ponds that contain water hyacinth range from 0.4 to 1.2 meters deep. Ponds that harbor duck weed range from 1.2 to 1.8 meters in depth.

Water hyacinths cannot tolerate cold weather, consequently they can be easily wiped out by a cold spell. Water hyacinth can also be victims of other catastrophic events that can wipe out entire populations. Reduction of plant cover in a treatment pond causes a serious decrease in its waste treatment effectiveness for weeks or even months while new plants establish themselves. (Kadlec and Knight, 1996)

Water hyacinths and duckweed can also be wiped out by pests. Coots (Fulica americana) and spider mites (Bryobia praetiosa) damage water hyacinth and greatly decrease the water treatment abilities of these plants (Wolverton and McDonald 1976)
Water hyacinth do not removed many types of micro-organisms common in waster water such as fecal coliform bacteria
Water hyacinth are not native plants (they were transplanted from Brazil) and they have no natural controls in the United States. Consequently they out compete other plants and take over aquatic areas quickly.

Pasted from <http://ecosyn.us/ecocity/Links/My_Links_Pages/Water_Pure_WH_01.html>