Biomass in Food and Energy Production

Heating the Midwest Conference

Carlton, MN

April 25th-26th, 2013

How it Began:

In October 2008, an inter-disciplinary Project Team of local stakeholders and regional renewable energy experts began discussing the possibility of transforming the Silver Bay

Business Park into an Eco-Industrial Business Park

Sustainable Industrial Development

- A Minnesota Pollution Control Agency grant for "Sustainable Industrial Development" was applied for and received in June 2009. The MPCA Grant assesses two elements. First, the ability to use wind, biomass and biodiesel to generate heat and power to make the park self-sustainable using renewable energy. Second, using industrial ecology and industrial clustering to achieve the ideology of "zero waste - zero emissions".

2 Concepts

- Industrial ecology is achieved by designing clusters of businesses and industries to network with each so that one industry's waste becomes another nearby industry's feedstock.

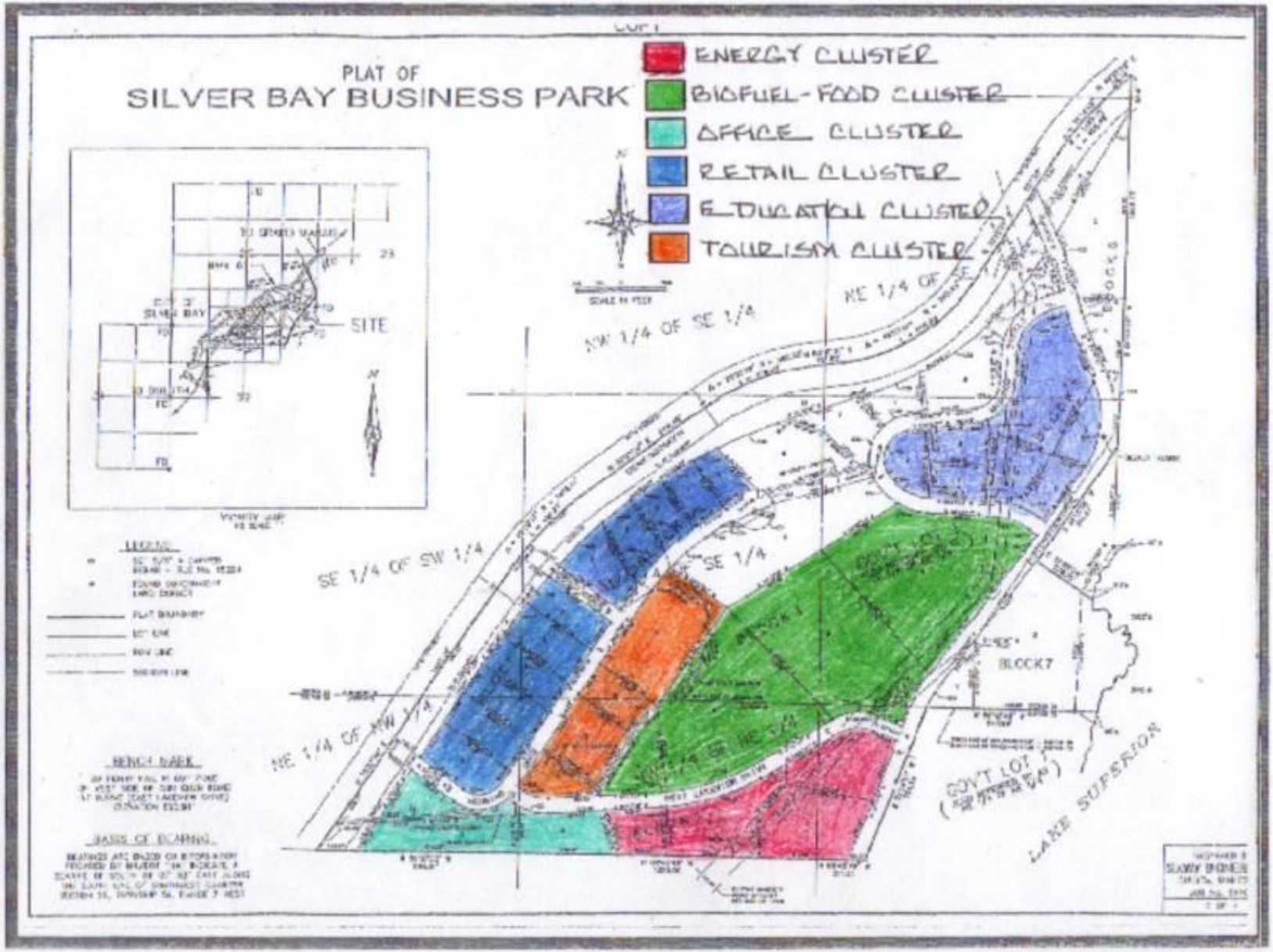
- The goal of the park is to be self sustainable, i.e., off the grid and powered by renewable energy production systems that are locally owned. It is strongly believed that the park is an ideal location for integrating three types of renewable energy (wind, biomass, biodiesel).

Cluster Based Economic Development

- Cluster based economic development refers to similar manufacturing processes or infrastructure needs, related feedstocks or resources that are typically positioned in a defined geographical area.
  - Reduces waste and pollution
  - Provides for resource conservation
  - Reduces transportation costs
  - Greater efficiency within related manufacturing processes.

Clusters Identified and Placed

- Energy Cluster
- Office Cluster
- Education Cluster
- Retail Cluster
- Tourism Cluster
- Biofuel – Food Cluster

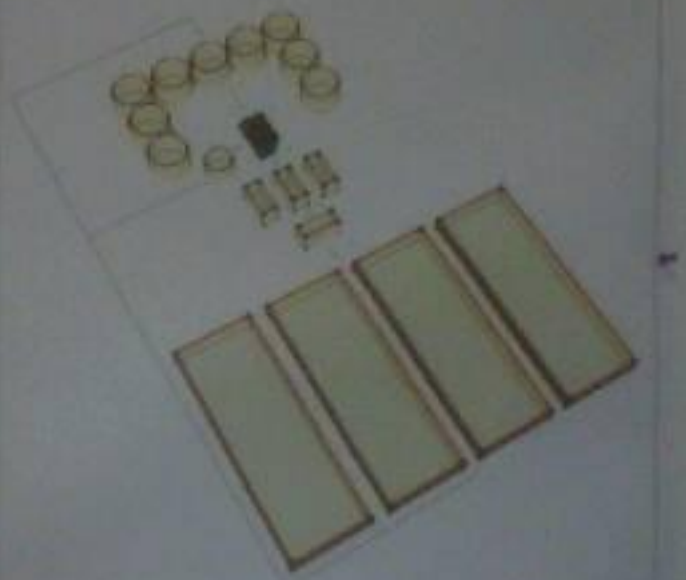

PLAT OF
SILVER BAY BUSINESS PARK
ENERGY CLUSTER
BIOFUEL-FOOD CLUSTER
OFFICE CLUSTER
RETAIL CLUSTER
EDUCATION CLUSTER
TOURISM CLUSTER
SITE
NW 1/4 OF SE 1/4
NE 1/4 OF SE 1/4
SE 1/4 OF SW 1/4
SE 1/4
NE 1/4 OF NW 1/4
BLOCK 7
BLOCK 8
(GOVT LOT 2)
LAKE SUPERIOR
BENCH MARK
BASIS OF BEARING

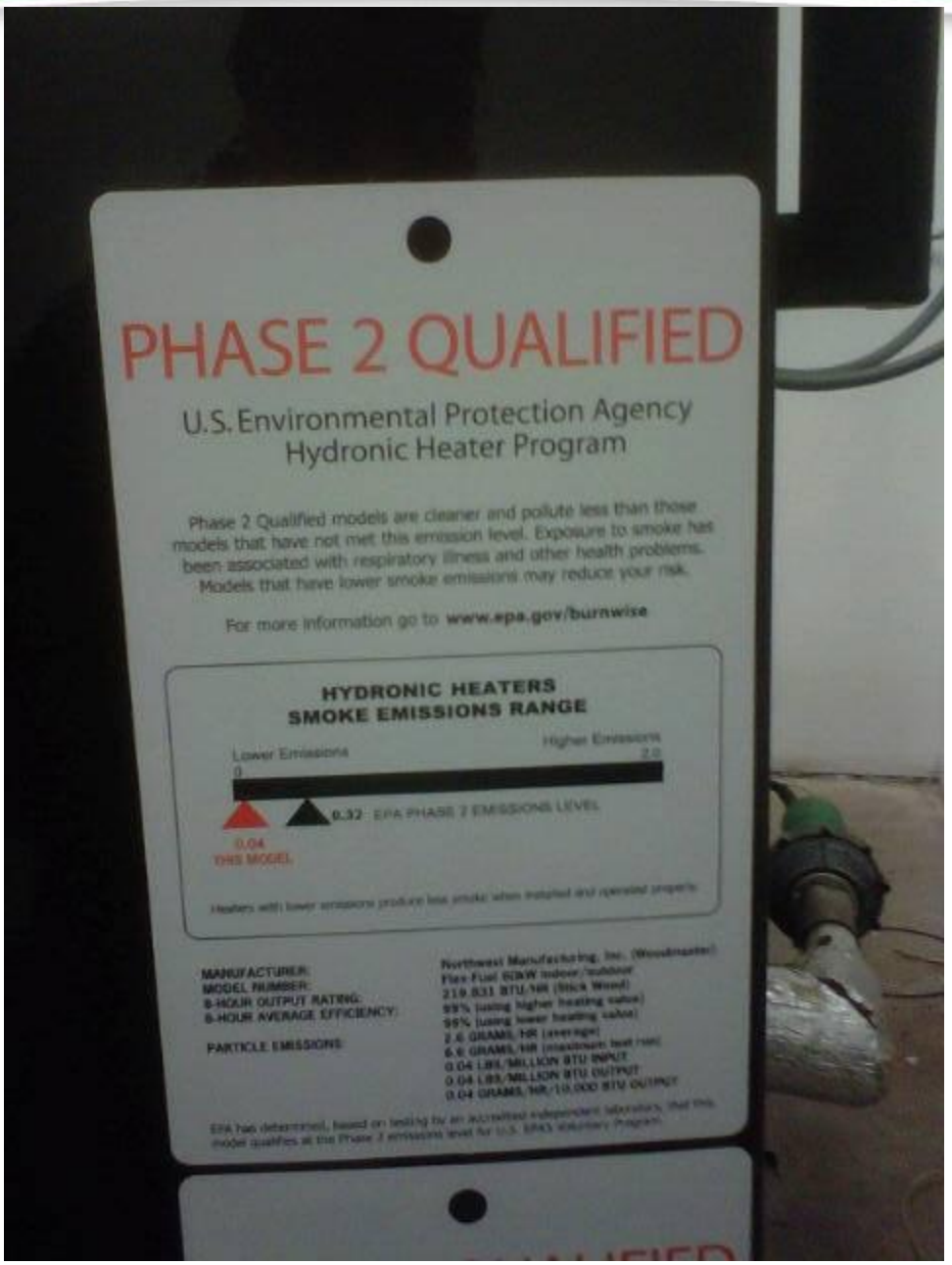
Economic Development Tool

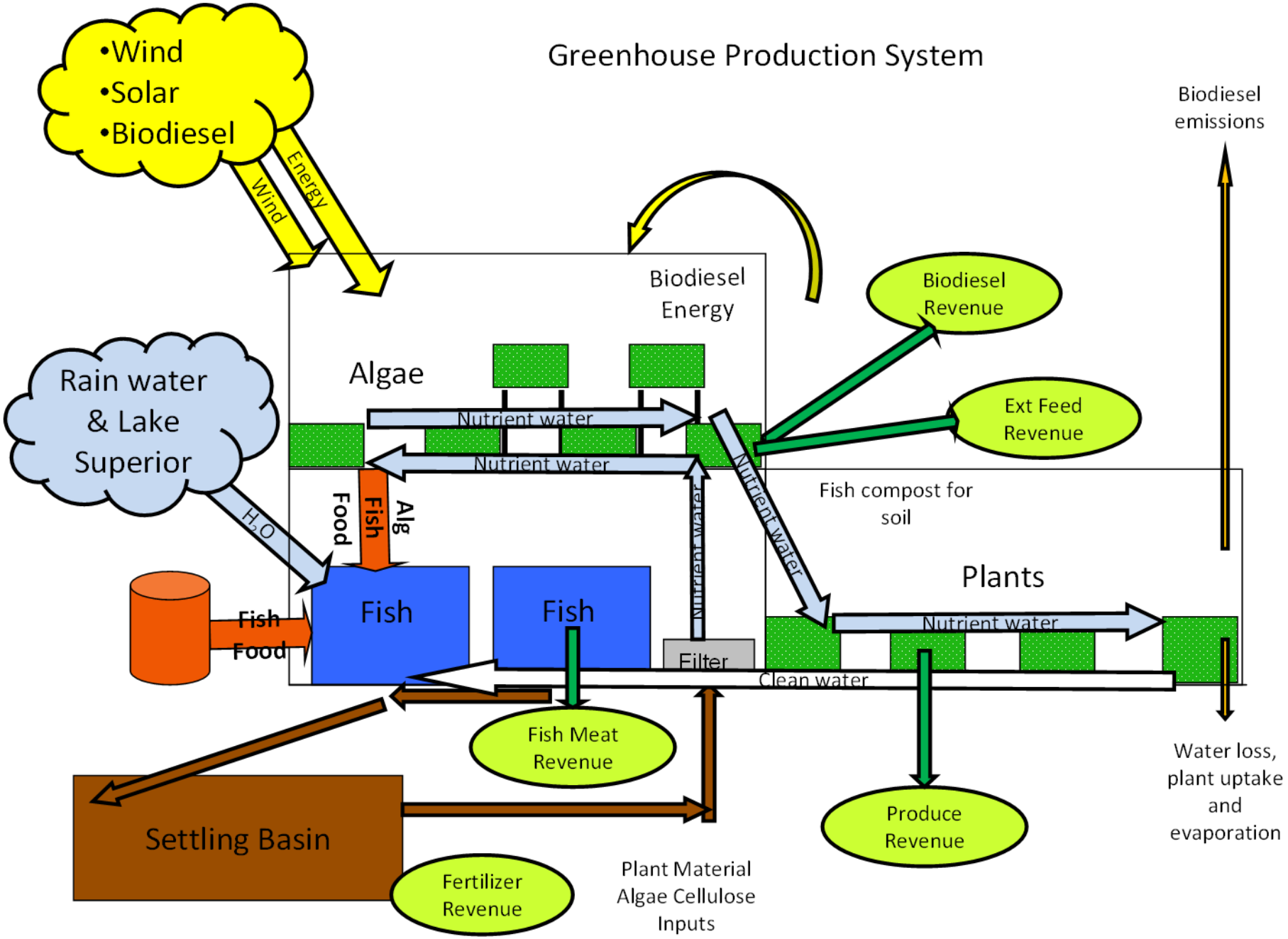
Businesses will be attracted to locate within the park as they will benefit from predictable renewable, sustainable energy costs. In addition, the need for fossil fuel consumption will be eliminated, which ultimately results in reductions in greenhouse gas emission, reductions in carbon footprint and reductions in waste.

Victus Farm Conceptual Diagram

The Victus System




PHASE 2 QUALIFIED
U.S. Environmental Protection Agency
Hydronic Heater Program
Phase 2 Qualified models are cleaner and pollute less than those models that have not met this emission level. Exposure to smoke has been associated with respiratory illness and other health problems. Models that have lower smoke emissions may reduce your risk.
For more information go to www.epa.gov/burnwise
HYDRONIC HEATERS
SMOKE EMISSIONS RANGE
Lower Emissions
Higher Emissions
0
2.0
0.32 EPA PHASE 2 EMISSIONS LEVEL
0.04
THIS MODEL
MANUFACTURER:
MODEL NUMBER:
8-HOUR OUTPUT RATING:
8-HOUR AVERAGE EFFICIENCY:
PARTICLE EMISSIONS:
0.04 LBS./MILLION BTU INPUT
0.04 LBS./MILLION BTU OUTPUT


Greenhouse Production System
•Wind
•Solar
•Biodiesel
Energy
Wind
Biodiesel emissions
Biodiesel Energy
Biodiesel Revenue
Algae
Nutrient water
Nutrient water
Ext Feed Revenue
Rain water & Lake Superior
H2O
Food
Fish
Alg
Nutrient water
Nutrient water
Fish compost for soil
Plants
Fish Food
Fish
Fish
Filter
Nutrient water
Clean water
Fish Meat Revenue
Water loss, plant uptake and evaporation
Settling Basin
Produce Revenue
Fertilizer Revenue
Plant Material
Algae Cellulose
Inputs