

HB12-1099

Colorado

## Industrial Hemp Remediation Pilot Program

### Background

Farming in America over the past few hundred years has significantly reduced the viability of the available soil for raising crops. Numerous physical, chemical and biological changes over the years have reduced the productive capabilities of these lands. These soils can be made more pristine through a rapidly growing industry of phytoremediation, another expanding Biotech industry.

Over the last two decades, remediation techniques for serious environmental pollution has attracted considerable attention. Many different processes have been employed for effective remediation of contaminated soil and water, including biological and chemical processes. The nature of soil contamination, location of the site, time required, and costs will determine what strategy is employed in any specific area.

Non-drug hemp is a plant that shows a large potential for its function as a phytoremediator. This study will assemble the data necessary to determine what parameters non-drug hemp will perform within for this application. Non-drug hemp is a viable plant to study due to its very strong tap root system and the depth of which it goes into the soil, one of the factors to consider when determining the depth of the required remediation.

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Other factors are rate of absorption, the range of growing requirements, the ability of the non-drug hemp plant to continue growing while absorbing numerous substances from the soil and water. The substances which non-drug hemp may mitigate include, but are not limited to heavy metals such as lead or mercury, dyes, pesticides, pharmaceuticals and excessive nutrients. These accumulated issues have lead to fish kills, loss of biodiversity, and has rendered water unfit for drinking and other agricultural or industrial uses in ever expanding areas. (1)

Using plants as a remediation method reduces costs and environmental impact to remediation sites. The economics, restrictions and benefits of phytoremediation have been thoroughly researched. (2) Recently, there has been a focus on soil and atmospheric pollutants. (3) non-drug hemp has been shown to bind organic compound contaminants from the air and soil. Non-drug hemp grows well in many types of soil conditions and is water efficient, which makes it an ideal plant for Colorado.

### Potential Sites

Target areas include farmland, mine dumps, and mill tailings. Other sites may include land fills, sludge and effluent runoff from agricultural, industrial and municipal waste areas could also be potential program areas.

### Economics

The scaling of the project will allow for flexibility of the programs funding. Farmers, consumers and business will benefit in a multitude of ways. As the project matures, the potential for economic return will increase due to the rejuvenation of the soil and water. Specific economic benefits from this project are an increase the usable land area for agriculture, improved hunting, bird watching and fishing habitats,

flood attenuation, wastewater treatment, and CO<sub>2</sub> sequestering. This also has positive implications to The Economics of Ecosystems and Biodiversity (TEEB), which demonstrates the value of ecosystems and biodiversity to the economy, to society and to individuals. To achieve the maximum benefit from this pilot program, it is in the best interest of the government, academia and businesses to work together to achieve these goals. The chart below are seven values that come out of the ecosystem.

### Phase One

To address the cost, safety, security of this phase of the pilot project, the testing and cultivation of samples will be located in an indoor grow facility. The initial stages require multitudes of testing scenarios and controls of all aspects to formulate a baseline set of data.

### Phase Two

This is where the pilot program is taken outdoors to a larger scale of implementation of specific results from Phase One, ranging from 1-500 acres.

### Disposal

After a season of non-drug hemp is cultivated, the materials of the plant, leaves, stalk, and seed, are to be disposed of in a controlled and secure manner. This is an additional economic opportunity for the local economy.

### Evaluation

The data collected from the non-drug hemp remediation pilot program will help determine the

economic impact of the changes in the ecosystem and their benefit. With the policy change of researching non-drug hemp and its impact on the ecosystem, the changes in ecosystem services and thus the impacts on human welfare will determine the programs effectiveness. Included below is a graph showing seven ecosystem services that are impacted. (fig 1)

### Legal

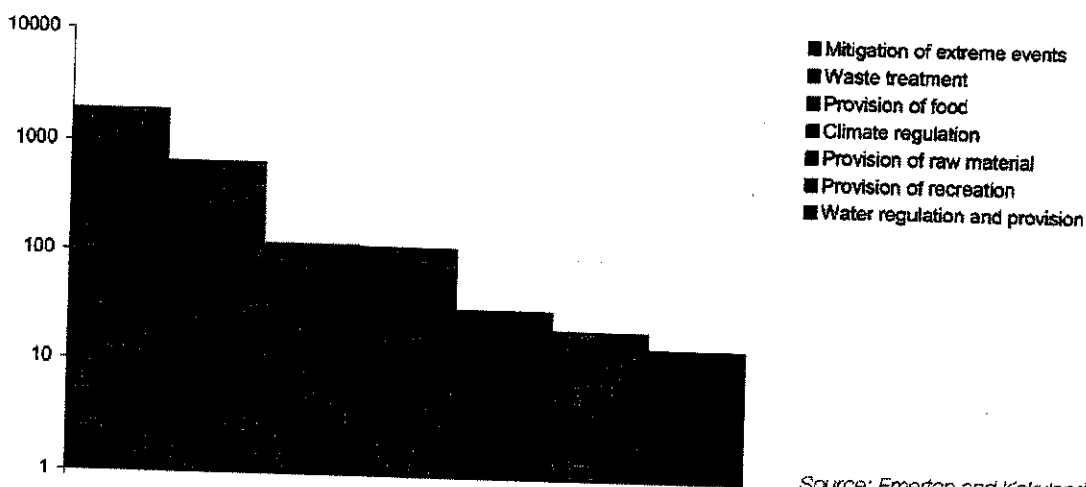
States Rights and the Tenth Amendment The Tenth Amendment states the Constitution's principle of federalism by providing that powers not granted to the federal government nor prohibited to the States by the Constitution are reserved to the States or the people.

On the Federal level, the legal issues with the DEA could be resolved with the signature of the president, as an administrative rule change.

Article 28, of the Single Convention on Narcotic Drugs of 1961, as amended by the 1972 Protocol, states that, "This Convention shall not apply to the cultivation of cannabis plant exclusively for industrial purposes (fiber and seed) or horticultural purposes."

- (1) Carpenter, S.R., N.F. Caraco, D.L. Correll, R.W. Howarth, A.N. Sharpley, and V.H. Smith. 1998. "Nonpoint Pollution of Surface Waters with Phosphorus and Nitrogen". *Ecological Applications* 8:559-568.
- (2) Cunningham et al. 1995; Pletsch et al. 1999; Burken et al. 2000; Macek et al. 2000)
- (3) Salt et al. 1998

Values of seven Ecosystem Services in Wetlands in US\$ per ha per year



Source: Emerton and Kekulandala 2003

Colorado

## Industrial Hemp Remediation Pilot Program

The health of our communities and future generations can be improved by implementing a hemp phytoremediation program. This has a positive contribution to the economic potentials of today through local economic stimulation.

### Why Phytoremediation?

- Phytoremediation costs 5% to 10% vs. Landfill costs
- 90% reduction in waste volume
- 90% to 95% reduction in metals from water
- Less Surface Disturbance

### Why Hemp?

- Low Water Use (12"-15" per year)
- Low to Zero Fertilizer Requirements
- Hemp Kills Noxious Weeds
- High Metals Uptake
- High Survival Tolerance for Existing Contaminants
- Erosion Mitigation
- More Studies Needed

### *The Pilot Program would specifically:*

- Create a set of data that would determine the effective remediation capacities of hemp
- Demonstrate that hemp can aid in improving soil conditions for the production of food crops
- Demonstrate the economic potentials for using hemp in remediation projects
- Demonstrate that hemp can remediate contaminants from water

### *Economic Potentials of the pilot program:*

- Increase the usable land area for agriculture; restore proper pH balance in the soil and water
- Improved hunting, bird watching and fishing habitats
- Flood attenuation (US\$ 772/ per acre)
- Industrial and domestic wastewater treatment (US\$ 265/ per acre per year).
- CO<sub>2</sub> Sequestering: (a damage cost of US\$ 10 per ton of carbon per year)
- H<sub>2</sub>O remediation of pharmaceutical contamination