Grain and Fiber Hemp

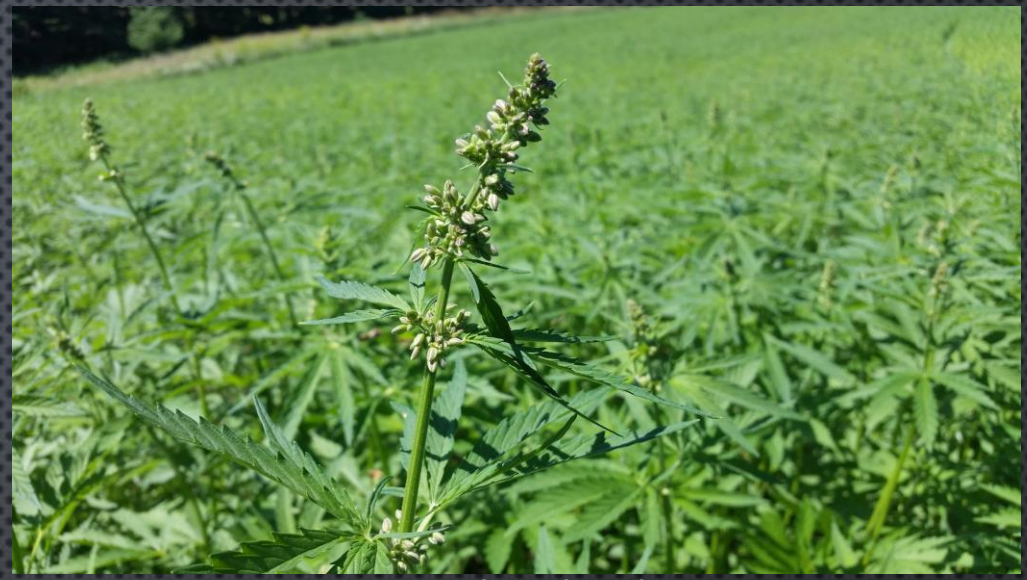
By

Bryan Parr

Agronomist – Legacy Hemp, LLC

Morphology

- Dicotyledonous Plant
- Primarily Dioecious
  - separate Male/Female Plants
- Sometime Monecious
  - Male/Female flowers on SAME plant
- Gender can be determined 4-6 weeks after planting
- Reproduction occurs through pollination
  - Pollen shed typically lasts 2-4 weeks



Male Plant

Female Plant

Morphology

- Hemp is Photoperiod Dependent
  - Short-Day: > 10 hours of darkness
- Plant height is determined by many factors, including Type of Hemp
  - Grain: 4-7 feet tall
  - Fiber: 8-14 Feet tall
- Roots can reach depths of 1-2 feet
- Growth rate is 1-3 inches per day during Rapid Growth Stage

http://www.hemptrade.ca/eguide/background/the-hemp-plant

Hemp Roots

TYPES OF HEMP

- CANNABIDIOL (CBD)
- FIBER
- GRAIN

TYPES OF HEMP

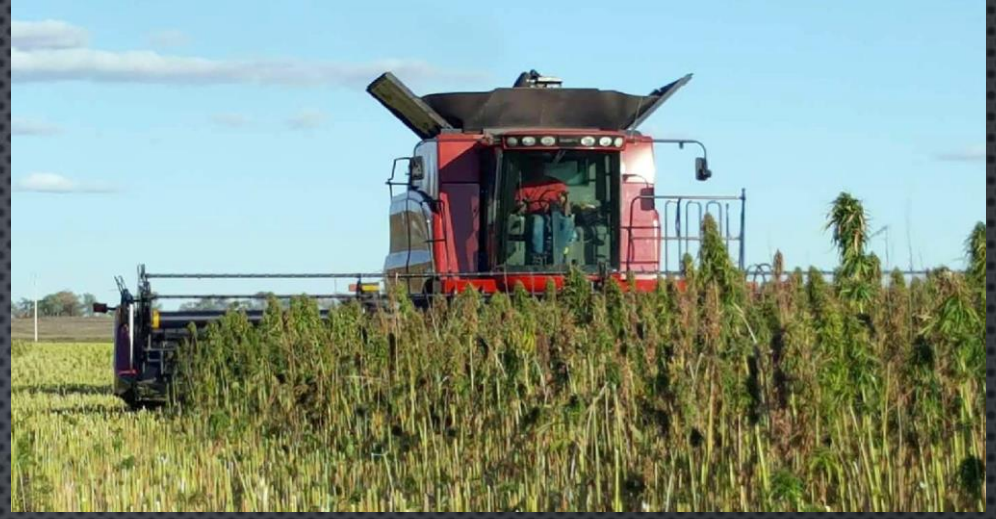
FIBER HEMP

- SIMILAR TO GROWING FORAGES (HAY)
- **PLANTING STOCK**: SEEDS
- **PLANTING METHOD**: GRAIN DRILL, BROADCAST
- **PLANTING RATE**: 40-60 POUNDS/ACRE
- **HARVEST METHOD**: MOWING, RAKING (1-3X), BALING (ROUND OR SQUARE)
- **POST-HARVEST**: BALES ARE STORED AT 10% MOISTURE UNTIL SHIPPED TO PROCESSOR

http://www.hemptrade.ca/eguide/fibre-production/fibre-harvesting-equipment

http://www.venturaseedcompanyllc.com/Contact%20Ventura%20Seed%20Company/Contact_Ventura_Seed_Company.html

Types of Hemp



Grain Hemp

- Similar to growing Small Grains (Wheat)
- **Planting Stock**: Seeds
- **Planting Method**: Grain Drill, Broadcast, Corn Planter
- **Planting Rate**: 25-35 pounds/acre
- **Harvest Method**: Combine
- **Post-Harvest**: Grain should be cleaned, then dried in aeration bins immediately after harvest

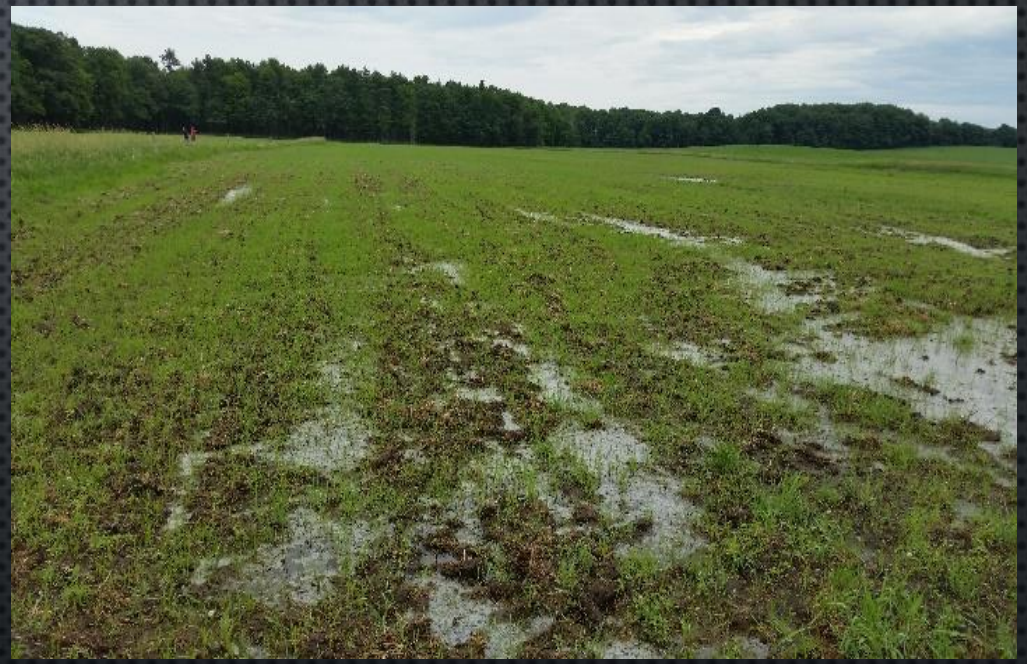
Climate and Soil Requirements

- **Soil Type**: Well-drained soils are best (Sandy-Loamy)
  - Heavy clay soils can remain saturated and cooler
- **Soil Temperatures**: >45-50°F
- **Optimum Air Temperature**: 65-75°F
- **Moisture Requirement**: Minimum of 10-15 inches
  - Doesn't like wet conditions but tends to be thirsty
- **Fertility**: Avoid marginal soils with low fertility
- **Photoperiod**: Requires >10 hours darkness to initiate flowering

Climate and Soil Requirements

Excess Moisture:

- First 30 days is most harmful
  - Increases potential for seedling diseases and plant mortality
    - Reduces stand count
  - Delays seed germination and causes uneven emergence
  - Significantly reduces vigor and competitiveness with weeds
  - Significantly reduces yields



Excess Moisture

Field Selection

General

- Fields that are most productive
- Fields with low weed pressure
- Fields that are well-drained
- Fields without compaction
- Fields without White Mold
- Rotation after Soybeans
  - Potential for White Mold
- Rotation after Corn
  - Increased nitrogen demand

Organic

- Rotations that provide naturally low weed pressure
  - Rotation after legume sod crops (Alfalfa, Clover)
    - Best weed control
    - Residual nitrogen
  - Rotation after winter rye
    - Terminate 10-14 days prior to planting to reduce potential allelopathic effect
  - Rotation after Corn/Soybeans
    - Higher weed potential
- Increase planting rates

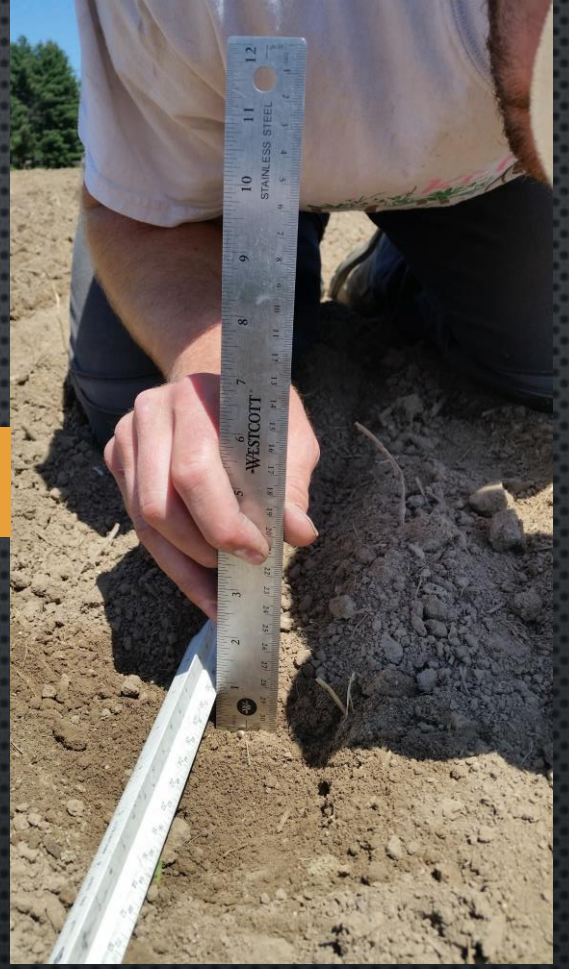
Fertility

- Nutrient demand increases with plant age – greatest demand is at flowering
- **pH Range**: 6.0-7.5
- **Nitrogen**: 100-125 pounds/acre (Grain); 40-60 pounds/acre (Fiber)
  - Majority is stored in the stalk
  - Excess nitrogen can cause lodging
- **Phosphorus**: 40-70 pounds/acre (Grain and Fiber)
  - Majority is stored in the seed
- **Potassium**: 60-100 pounds/acre (Grain); 250-350 pounds/acre (Fiber)
  - Majority stored in the stalk
- **Sulfur**: 15-25 pounds/acre

PLANTING

- Firm, shallow seedbed
  - Rolling/Packing for good seed-to-soil contact
- **Planting Depth**: ¼ - ¾ inches
  - **Target**: ½ inch
- **Planting Rate**:
  - Fiber: 40-60 pounds/acre (23-34 seeds/ft^2)
  - Grain: 25-35 pounds/acre (14-20 seeds/ft^2)
- **Planting Method**: Grain Drill/Air Drill, Brillion Seeder, Broadcast, Corn Planter (grain)
- **Planting Date**:
  - Fiber: April to May (>45°F soil temp)
  - Grain: May to June (>50°F soil temp)
- Plant AFTER a rain, NOT BEFORE

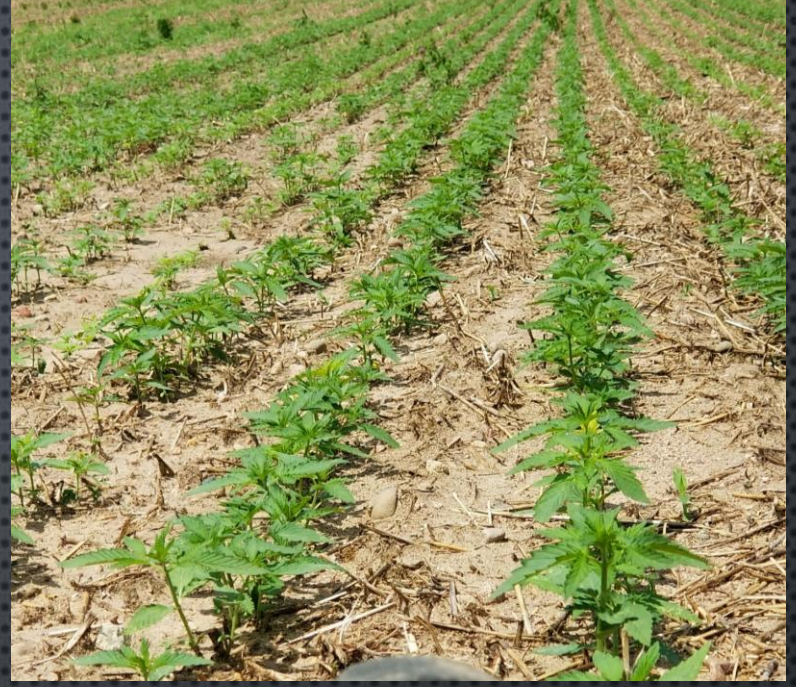
Planting Depth is IMPORTANT!

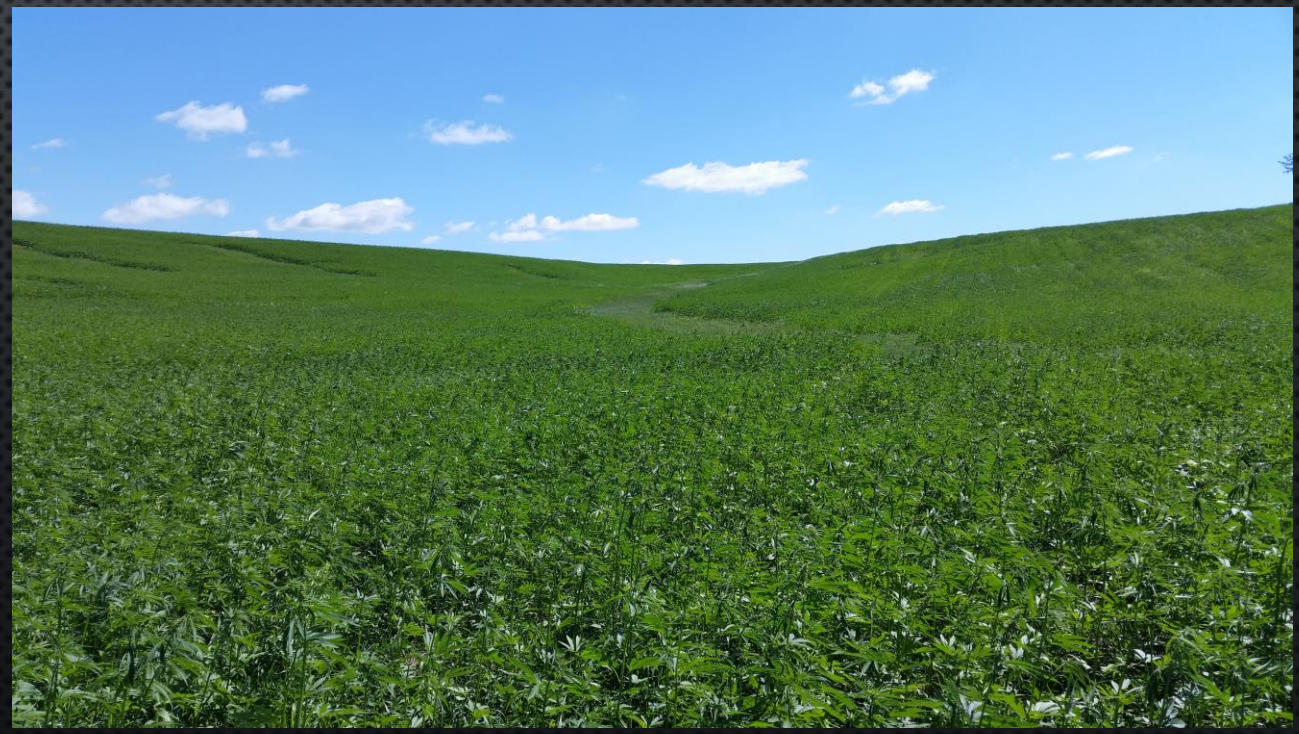


Growth Stages

Vegetative Phase

- **Germination**: 24-48 hours
- **Emergence**: 4-10 days
- **Slow Growth**: Day 1-30
  - ¼ - ½ inch per day
  - 8-12 inches total growth
- **Rapid Growth**: Day 30-60
  - 1-3 inches per day
  - 24-60 inches total Growth

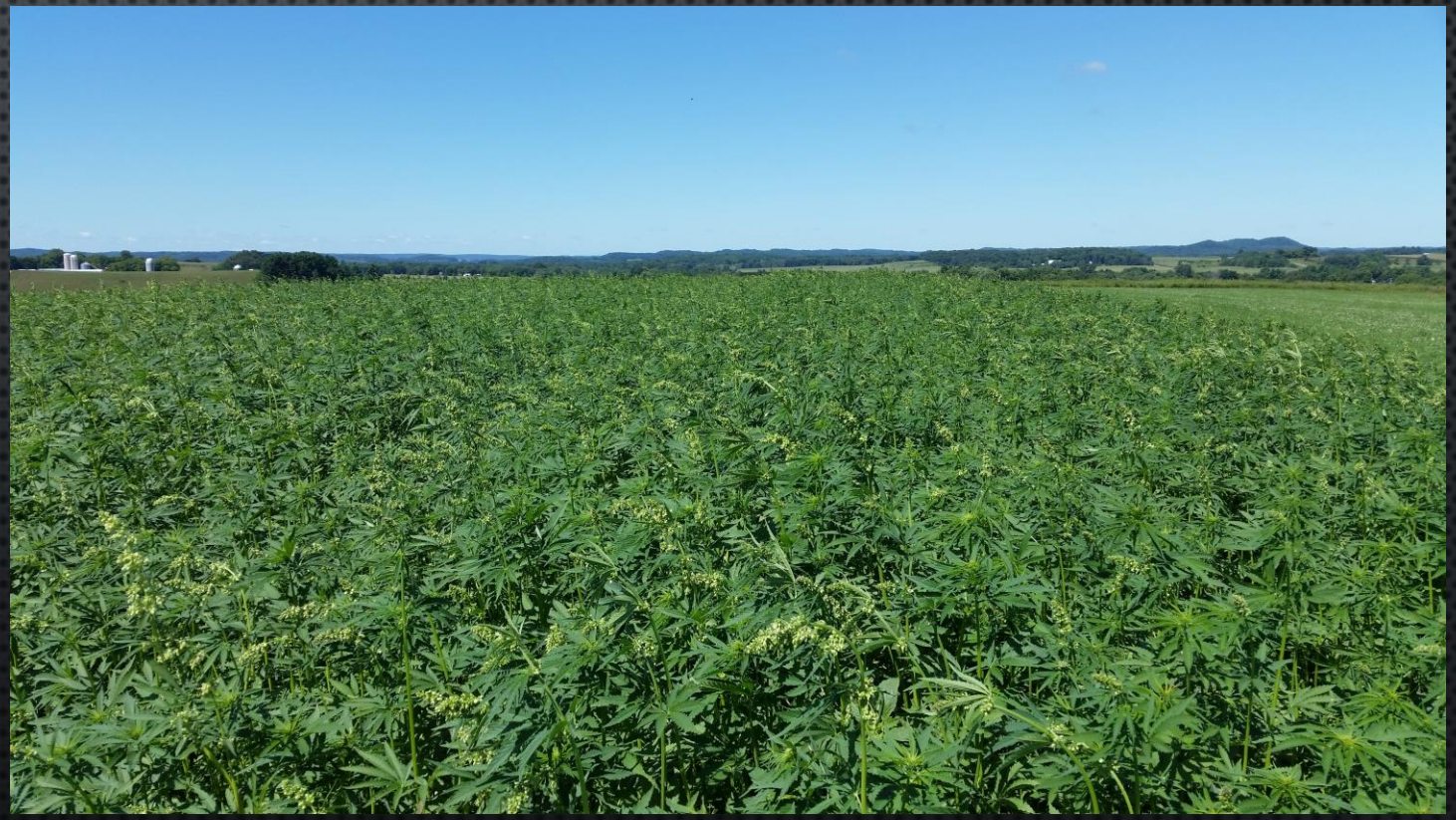




Growth Stages

Reproductive Phase

- **Reproduction**: Day 60-90
- **Maturity**: Day 100-110
- **Harvest**:
  - Grain: Day 110-130
    - September/October
    - **Grain Moisture**: 12-18%
  - Fiber: Day 70-90
    - July/August – Mowing
    - August/September – Baling
    - **Bale Moisture**: 10-12%



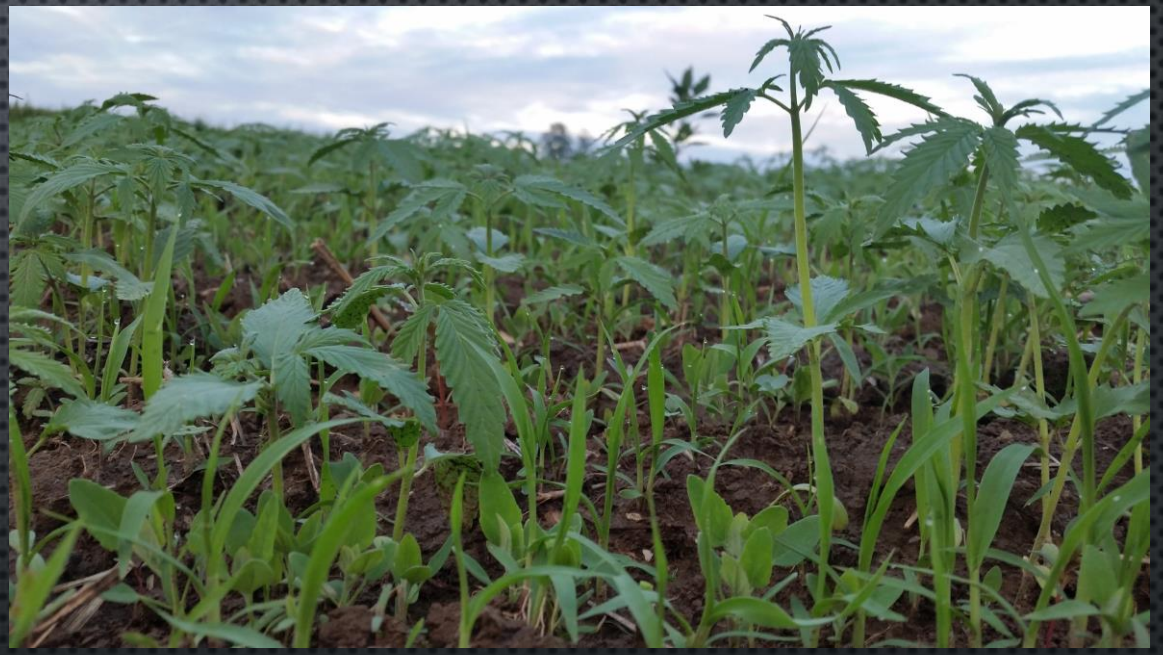
ROTATION EFFECT

- Adding hemp to a rotation can improve:
  - Soil structure and soil tilth
  - Infiltration and soil moisture
  - Nutrient cycling
  - Reduces nutrient leaching
  - Phytoremediation of contaminated soils
    - Heavy metals
    - Nuclear Wastes

https://steemit.com/cannabis/@doitvoluntarily/using-hemp-for-radiation-cleanup

Pests (Weeds)

- One of the most significant pests of hemp
- Field Selection is critical
- Find situations that reduces weed pressure
  - Plant after legume sod crops (Alfalfa, Clover)
  - Plant after a rain, not before
    - Plant during a dry period
  - Good soil fertility
  - Well-drained soils
- Use of soil amendments
  - Gypsum
  - Lime
  - Compost
- Weed control during first 30-Days is critical
- Possible mechanical control (Rotary Hoe, Tined-Weeder, Harrow, Cultivator)



Weeds during Slow Growth Phase

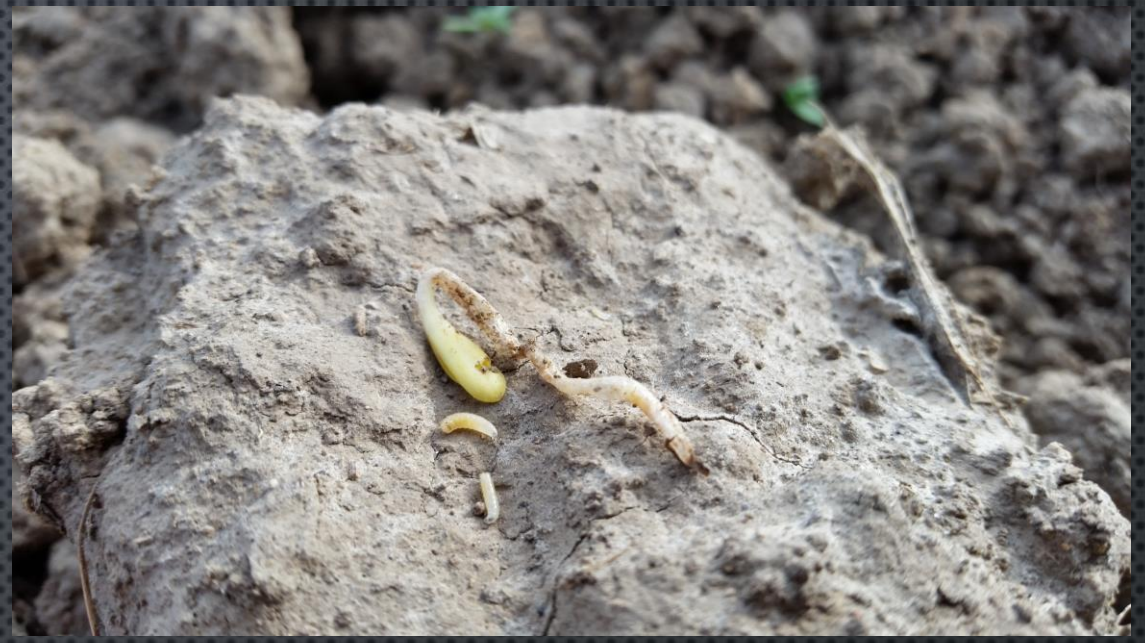
Pests (Disease)

- Two Significant Diseases:
  - White Mold (*Sclerotinia sclerotiorum*)
  - Gray Mold (*Botrytis cinerea*)
- Conditions for mold
  - High Humidity
  - Drizzle/foggy conditions (maritime-like)
  - Cool – Moderate temperatures (overnight)
- Reduce Disease Pressure
  - Avoid fields prone to White Mold or Gray Mold
  - Consider rotating after corn rather than soybeans
    - After a sod crop (preferred)
  - Reduce plant populations (increases airflow)
  - Deep tillage to bury sclerotia
  - Use of preventative biological fungicides – Contans, MycoFighter

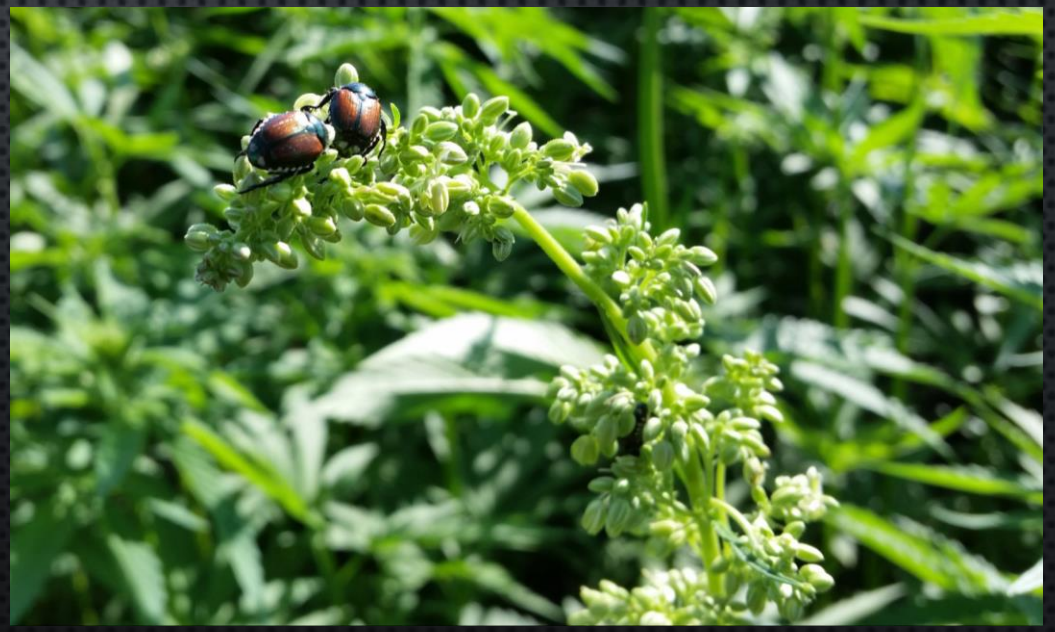
White Mold – Left, advanced stage; Right, beginning stage

Pests (Insects)

- Generally, insect pressure is not economically significant
  - Greenhouses may be different
- Common Insect Pests
  - Seedcorn Maggot
  - Spider Mites
  - Aphids
  - Whiteflies
  - European Corn Borer
  - Japanese Beetles
  - Grasshoppers



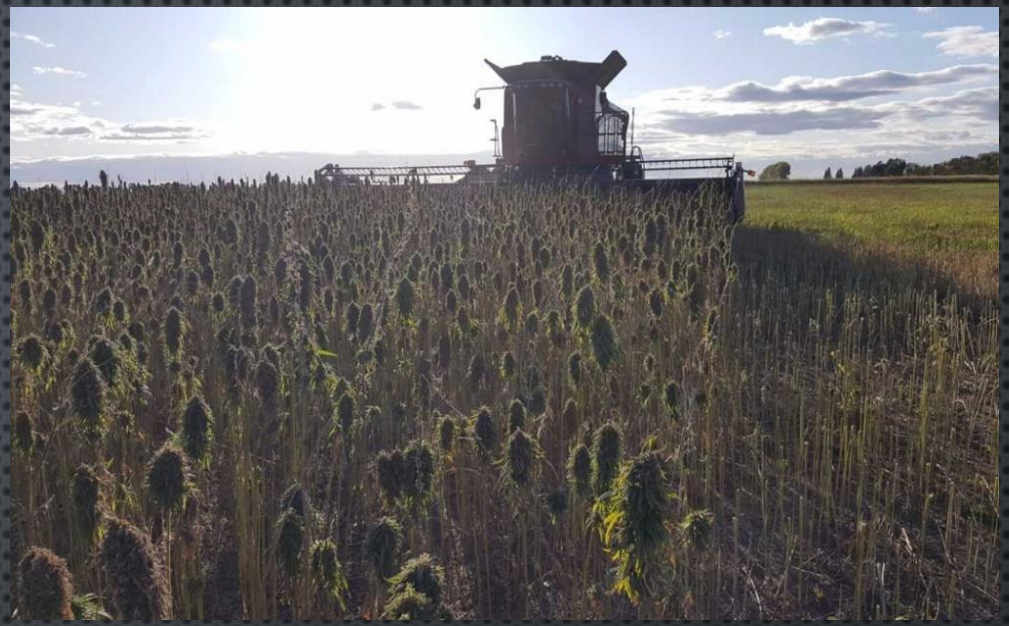
Seedcorn Maggot



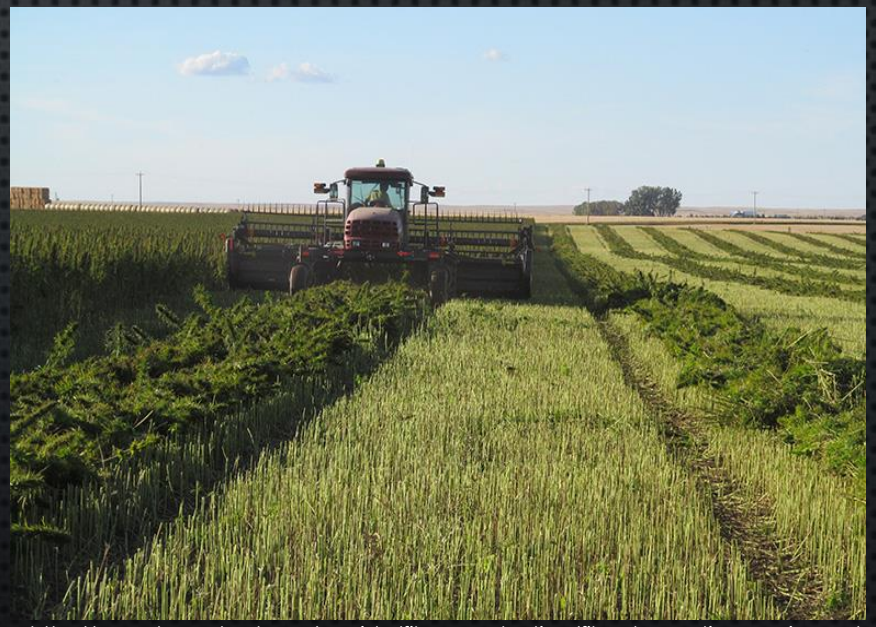
Japanese Beetle

HARVEST (GRAIN)

- Harvest moisture: 12-18%
  - Must be dried to 9% in aeration bins within 4-6 hours after combining
- Straight cut combining is recommended
  - Draper headers are preferred
- Cut grain heads only
  - Reduces the amount of fiber through the combine
- Swathing is NOT recommended
  - Combine 1-3 days after swathing to prevent over-drying stalks



Straight Cutting



http://www.hemptrade.ca/eguide/fibre-production/fibre-harvesting-equipment

Swathing

Harvest (Fiber)

- Harvest Timing:
  - Mowing:
    - First 1-2 weeks of pollination (July/August)
    - Leave 4-6 inches of stubble to reduce ash content
  - Raking:
    - Rake when stalks turn from green to pale yellow
    - 1-3 turns may be required
- Retting Period: 2-6 weeks (depends on environment)
  - Baling
    - Bale moisture: <12%
    - Large Square Bales are preferred

http://www.hemptrade.ca/eguide/fibre-production/storing-baled-hemp-fibre

Retted Hemp Straw

http://www.hemptrade.ca/eguide/fibre-production/salvaging-hemp-fibre

Baling

Summary

- Field selection is important
  - Well drained soils
  - Highly productive, low weed pressure fields
  - Organic – Best to follow sod-forming Legume (alfalfa, clover)
- Early season weed control is critical (first 30 days)
  - Mechanical weed control may be limited
  - Think of ways that promote rapid emergence and seedling growth
    - Good seedbed preparation
    - Good fertility is important
- Scout fields regularly to identify plant stresses
  - Pests, nutrients, moisture

Resources

- Canadian Hemp Trade Alliance (online)
- Alberta Agriculture and Forestry – Industrial Hemp (online)
- Growing Industrial Hemp in Ontario (online)
- Industrial Hemp Production and Management – Manitoba (online)
- Hemp Production in Saskatchewan (online)
- Hemp Diseases and Pests: Management and Biological Control (book)
- The Cultivation of Hemp: Botany, Varieties, Cultivations and Harvesting (book)
- Marijuana Botany: The Propagation and Breeding of Distinctive Cannabis (book)

QUESTIONS?

AGRONOMIST – LEGACY HEMP, LLC

BRYAN PARR