Progress on Predicting Yield Loss From Weeds

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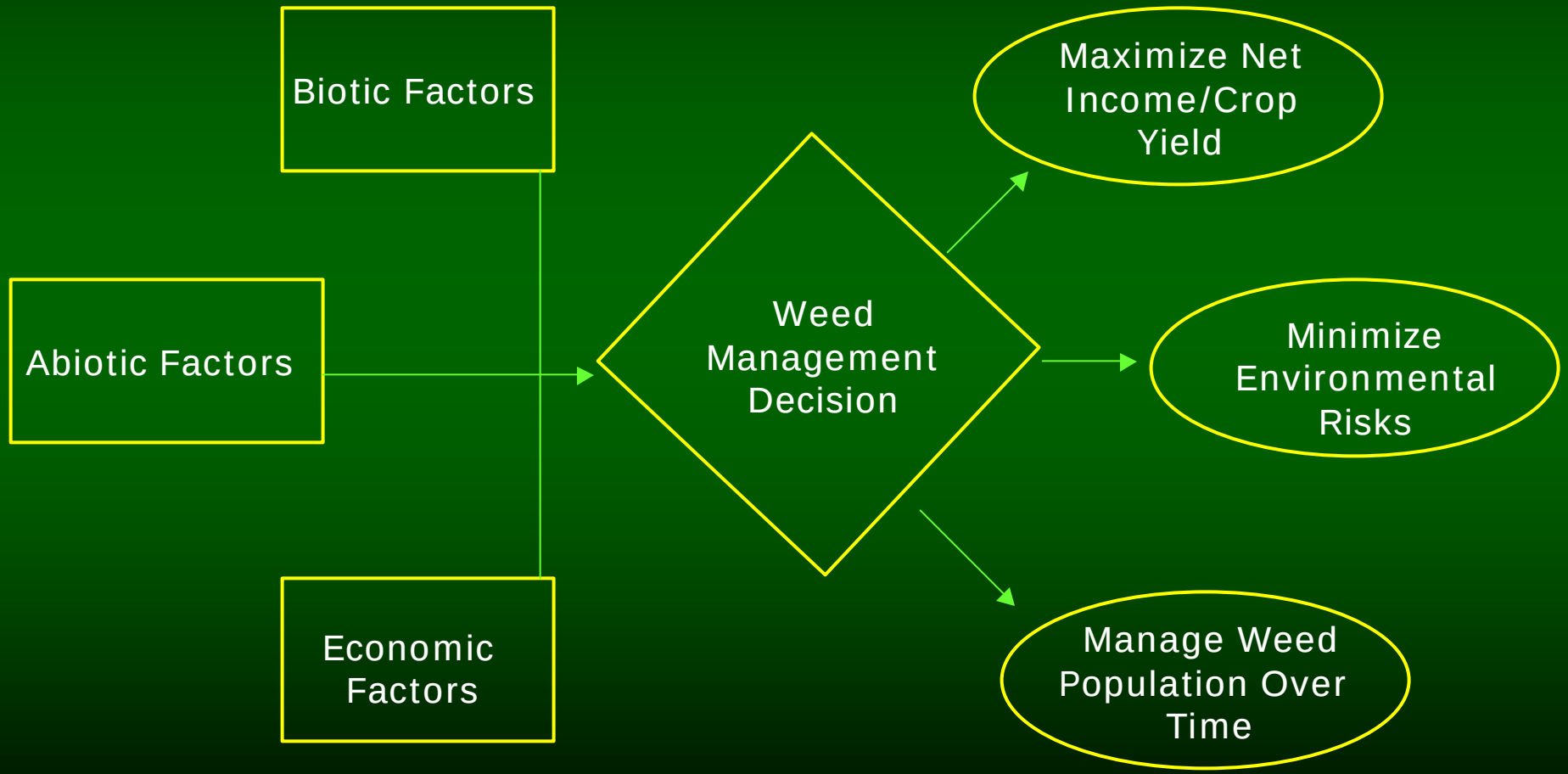
Overview

- Rationale - Why are we interested in predicting crop yield loss resulting from weeds?
- Review – Various approaches to predicting crop yield loss: empirical vs. mechanistic
- Research - Past and current UW-Madison work on yield loss prediction

Weed Management Decision-Making



Decision-Making Factors

Biotic

- Crop/Weed Type
- Competitive Ability
- Crop Yield
- Weed Seed Production
- Resistance Biology

Abiotic

- Soil Attributes
- Tillage System
- Environmental
- Herbicide Attributes
- Weed and Crop Spatial Pattern

Economic

- Crop Value
- Cost of Inputs
- Externalities
- Land Tenure
- Governmental Programs

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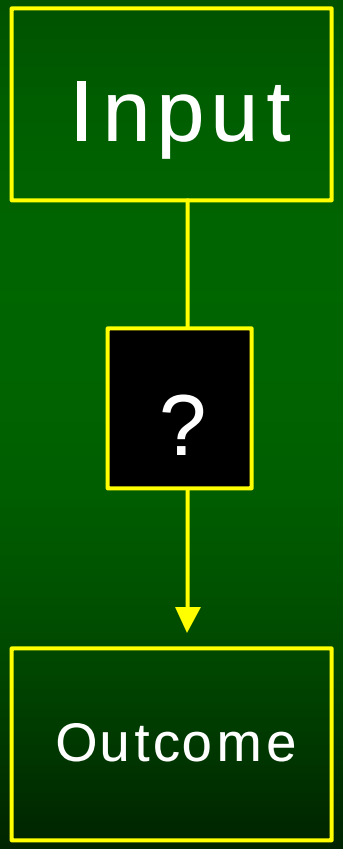
Bioeconomic Models
Decision Support Tools

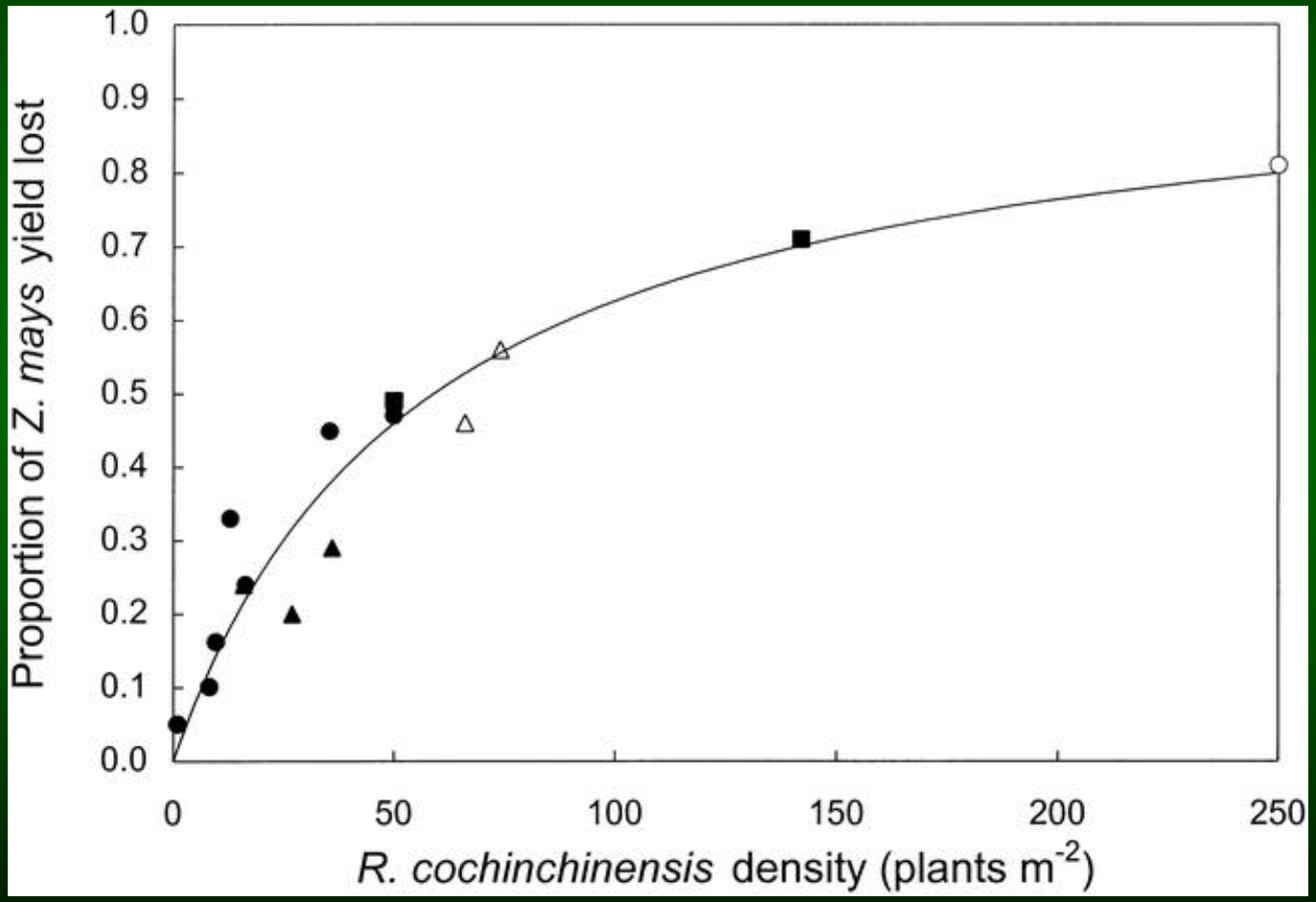
- Coherent, comprehensive framework for analysis
- Synthesis of variables
- Optimization of multiple outcomes
- Requires detailed knowledge



Crop Yield Loss Prediction

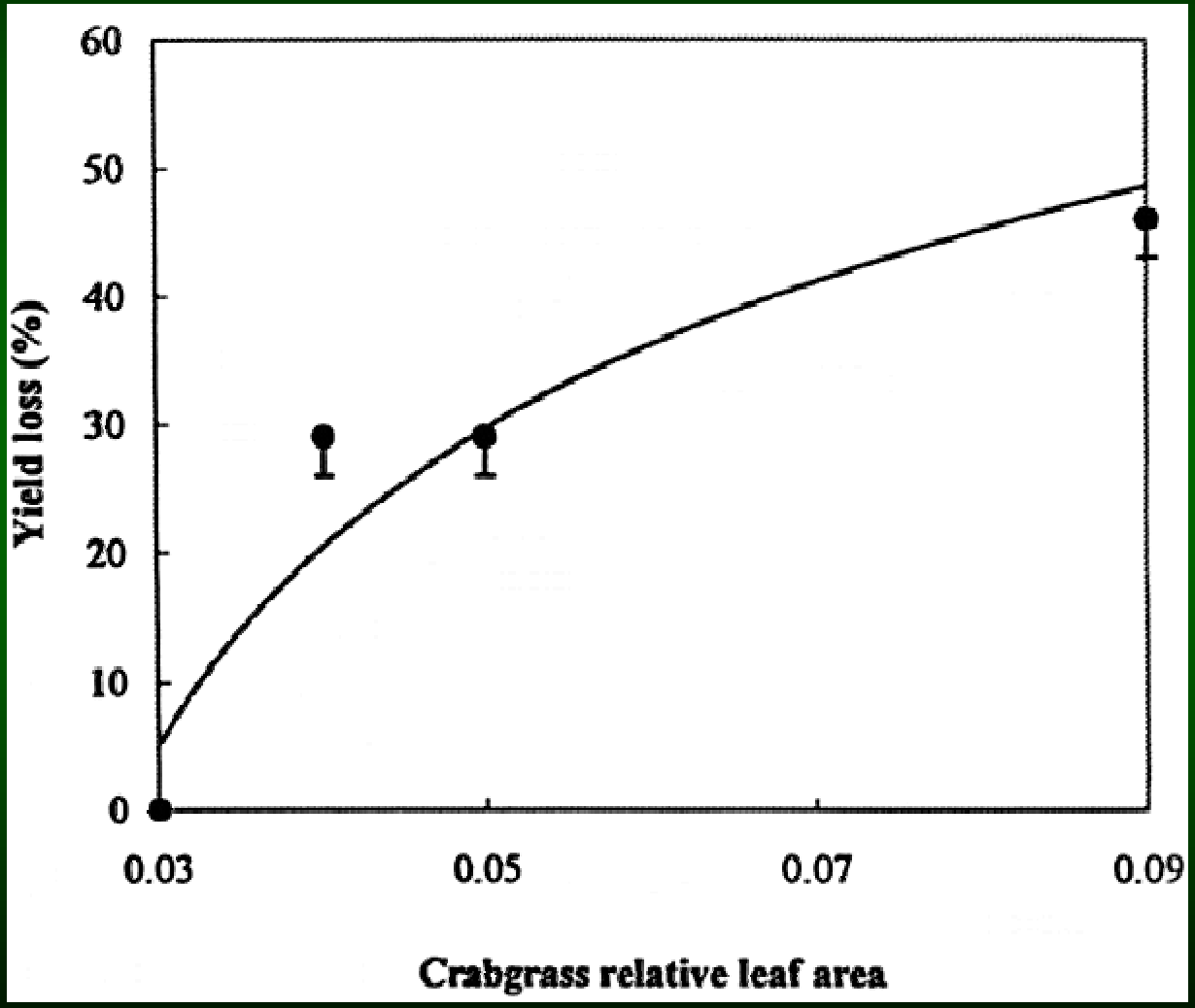
- Critical periods for control
- Economic injury thresholds

Empirical Models
Weed Density-Based



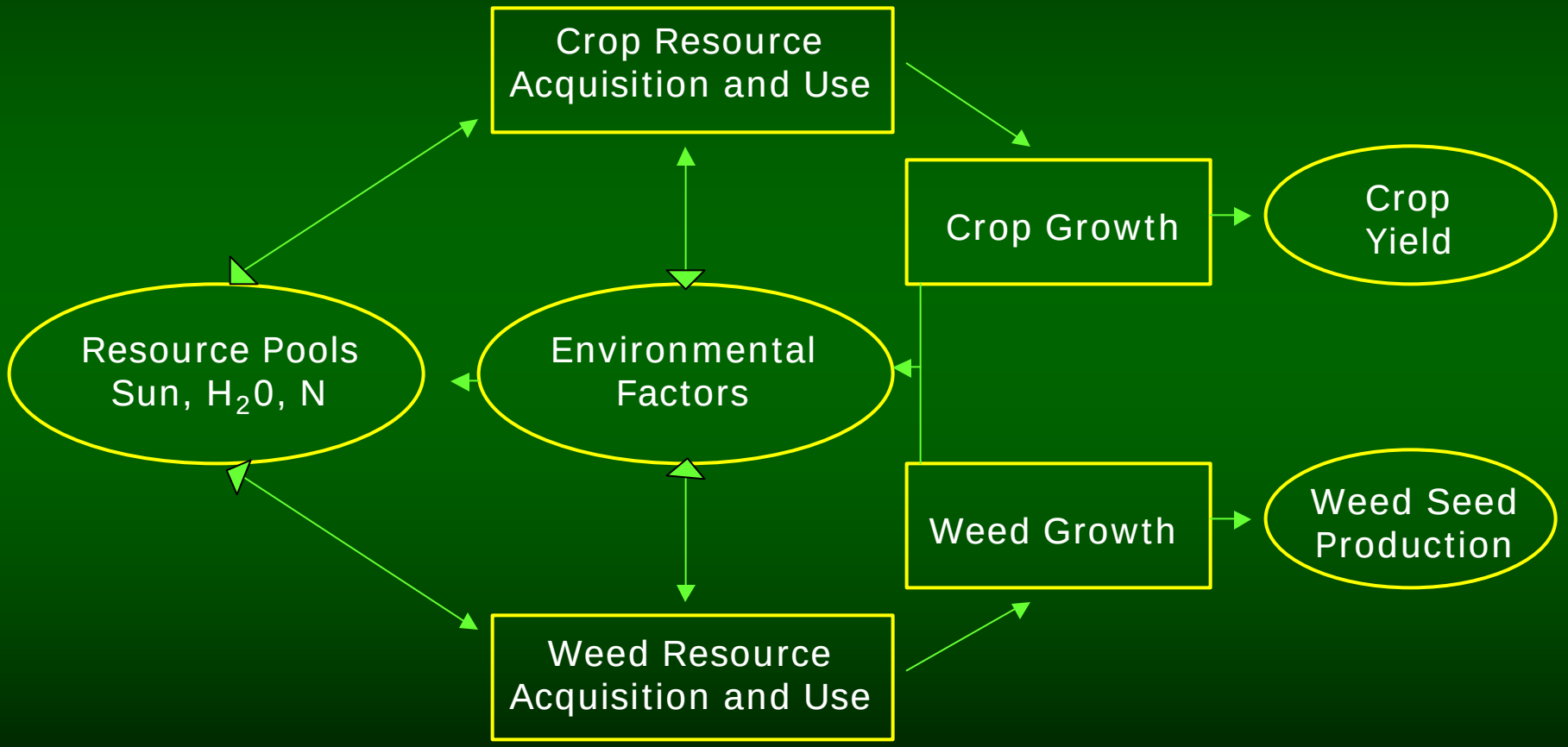
Smith, M. C. et al. 2001. Weed Sci. 49:123-134.

Empirical Models
Modifications

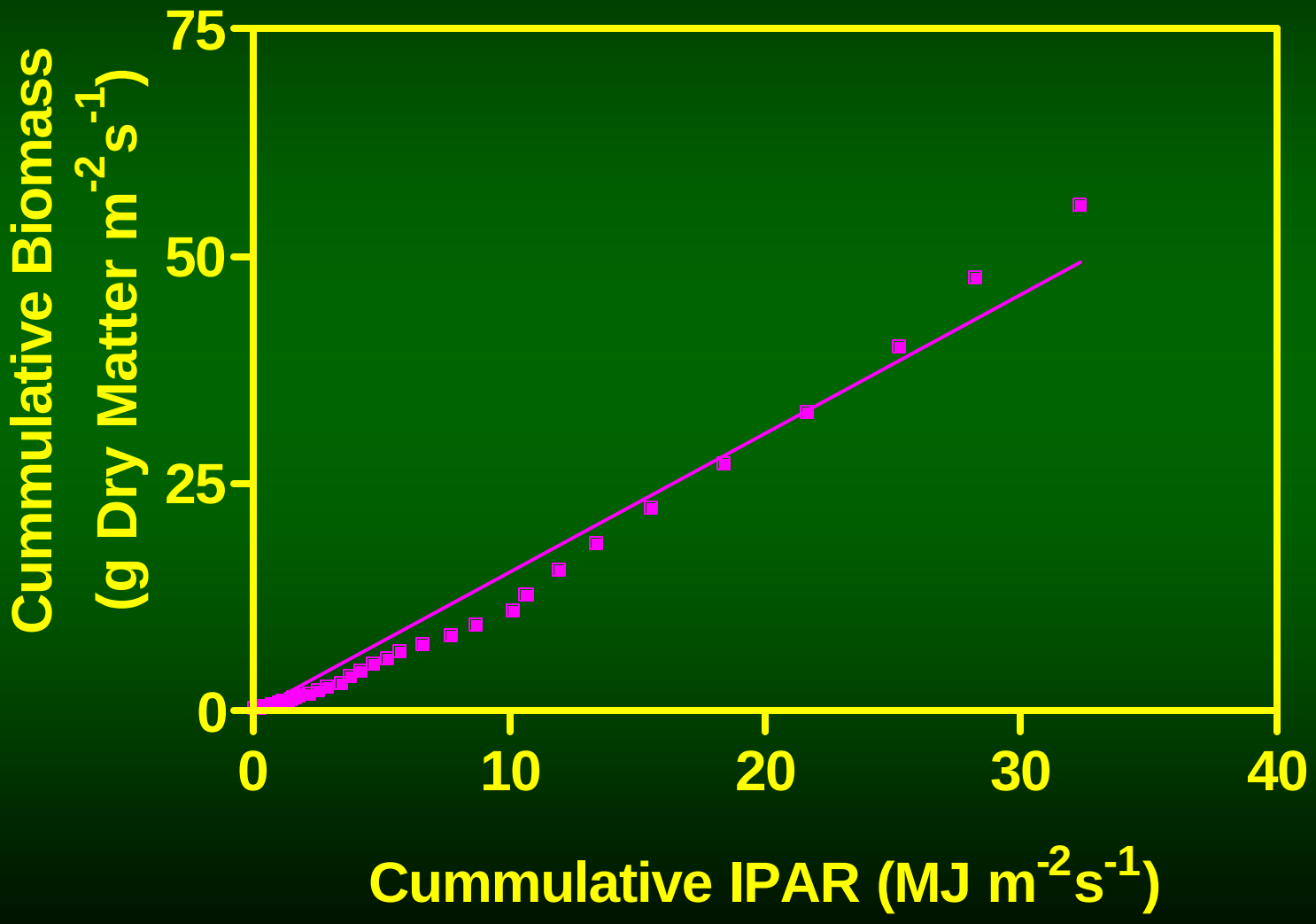


Aguyoh, J. N. and J. B. Masjunas. 2003. Weed Sci. 51:171-176.

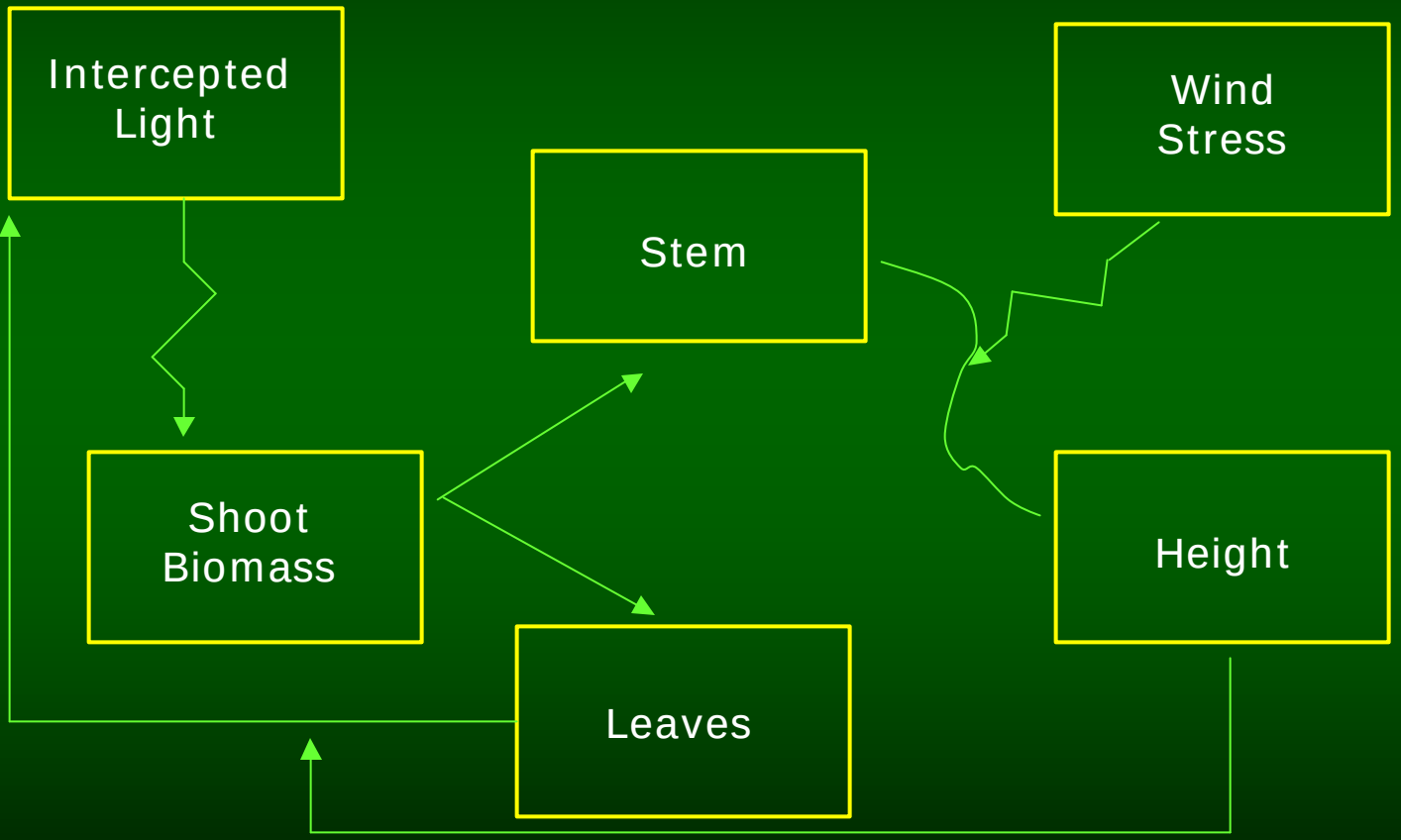
Mechanistic Approach



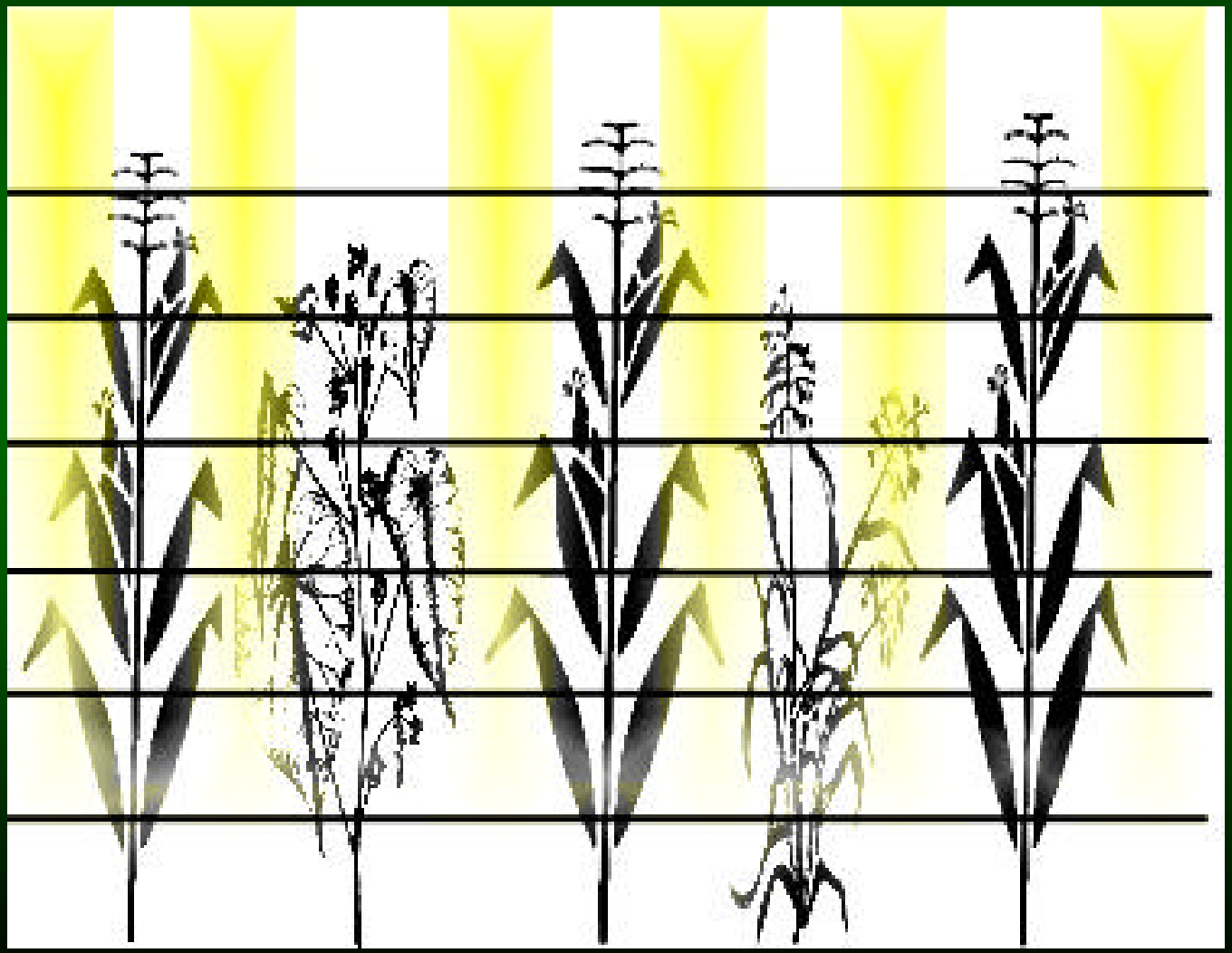
Light Use Efficiency



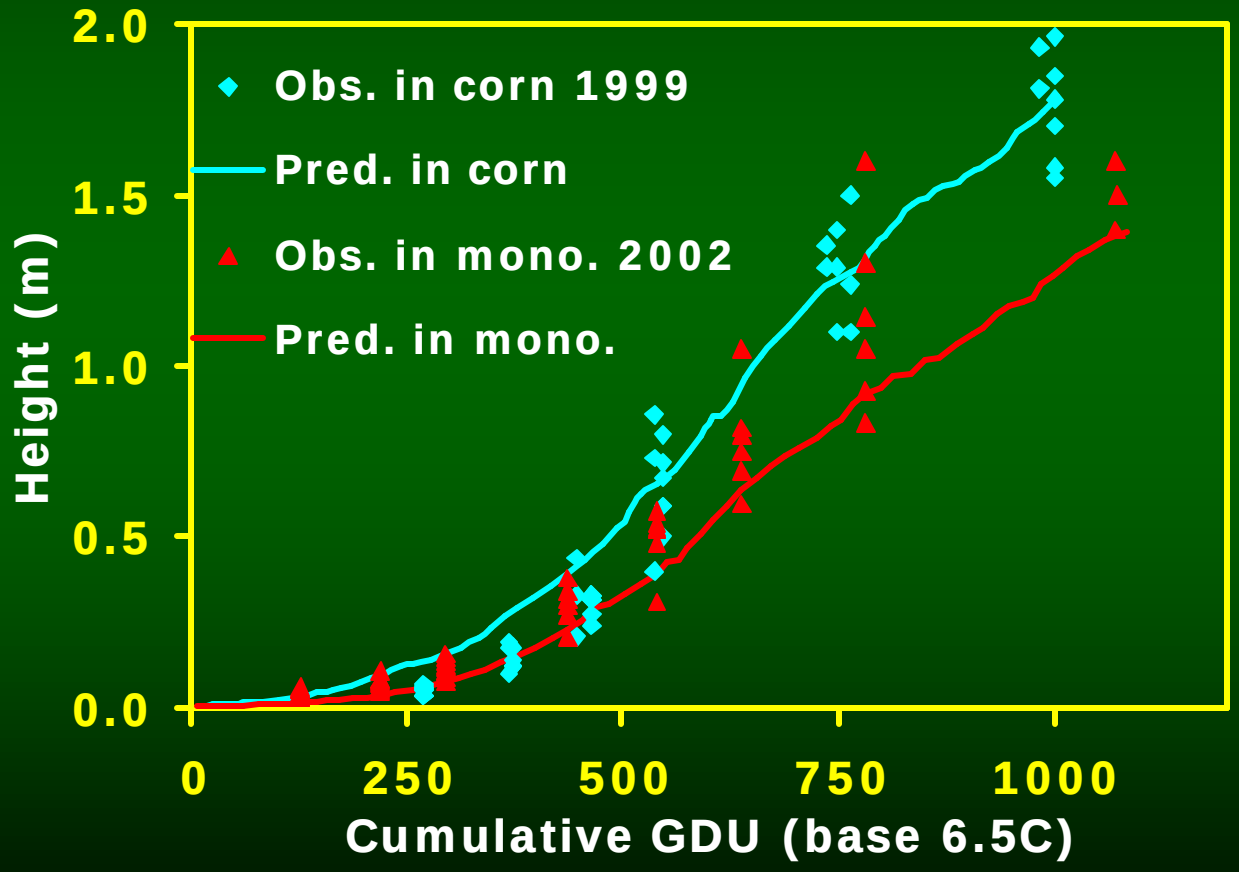
A Simple Mechanistic Model



Light Distribution In Plant Canopies



Common Lambsquarters Height Prediction



Summary and Conclusions

- Accurate and robust approaches to predicting of crop yield loss will facilitate the development of more comprehensive weed management tools
- Mechanistic models of plant growth in multi-species communities will enable more accurate crop yield loss predictions needed to develop these tools
- Future research at UW-Madison will focus on refining a mechanistic model of plant growth and validating it in other weed-crop communities