

Figure 1. Glyphosate-resistant horseweed has been found in several states. Color codes indicate the year confirmed.

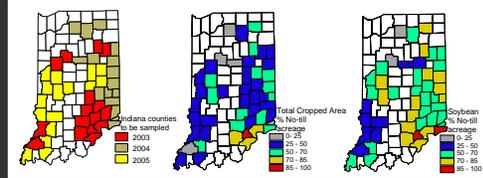


Figure 3. Counties selected for the horseweed survey project with the corresponding % of total cropland and soybean acreage under no-till production systems in 2002.

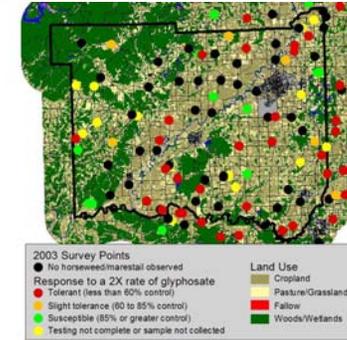


Figure 5. Example of a county map showing survey site locations and horseweed tolerance to glyphosate (Jackson county, 2003).

## Methods

**County-Selection** - During this three year study, we are intensively sampling about 16 counties each year (Figure 3). Counties were selected on the basis of the proximity to counties with confirmed resistant populations, acreage in no-till production, and cropping history.

**Survey Sites** - Within each county, survey sites were randomly pre-determined from NASS Cropland Data Layer and United States Geological Service digitized aerial imagery which has been compiled for each county in Indiana by the Purdue Center for Advanced Applications in Geographic Information Systems (Figure 4). Counties were divided into grids of 2000 to 4000 acres of cropland, and one field historically cropped to soybean was selected for surveying (Figure 4 lower left corner). Routes were developed by establishing driving routes between the random GPS points and followed using a GPS unit. The survey was supplemented by sampling fields and non-cropped areas in which horseweed was observed from the road. At each sample site, a field survey form was completed which recorded the presence of other weeds, tillage practices, and other information pertinent to the study. When horseweed was found, seed heads were collected from 40 plants and brought back to campus for glyphosate screening. The 2003 seed samples were grown and screened for resistance to glyphosate in the greenhouse during the fall and winter of 2003/2004. The 2004 seed samples will be screened for glyphosate tolerance this winter.

**Map Development** - County level maps have been developed from the 2003 survey. These maps show the geographic areas where horseweed was found and whether or not it was resistant to glyphosate (Figure 5).

**Information Dissemination** - A website dedicated to our horseweed project was developed and put online in the fall of 2004. This site provides current information about the Indiana horseweed survey project, biology and ecology studies, and management strategies and recommendations to crop producers (Figure 6).

## Introduction

Glyphosate-resistant horseweed (*Conyza canadensis*) has become an important weed problem in many states since it was first discovered in Delaware (Figure 1). Indiana horseweed samples were first screened in the fall of 2002 from fields in Jackson and Washington counties in southwestern region of the state. Subsequent greenhouse trials confirmed that these samples were resistant to glyphosate applications of 3 lb ae/A or 4x the normal use rate. During the 2003 growing season, a population from Clark county was also screened and confirmed resistant in an on-farm efficacy trial.

An intensive sampling effort was conducted in the fall of 2003 and 2004 (Figure 2) to address the threat glyphosate-resistant horseweed (GRH) presents to no-tillage soybean producers. The objectives of this project are to:

- 1) characterize the frequency and distribution of horseweed (both resistant and susceptible) in Indiana
- 2) develop maps depicting the specific geographic areas where horseweed escapes were present and their subsequent tolerance to glyphosate
- 3) relay the information to Indiana soybean producers so proper control and preventative measures can be taken to preserve no-tillage and Round-up Ready® soybean production practices

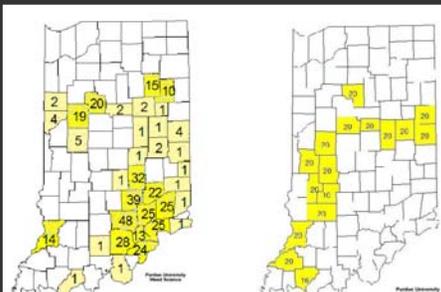
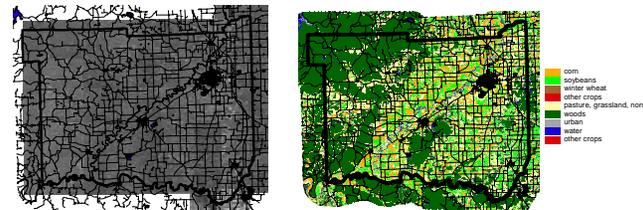
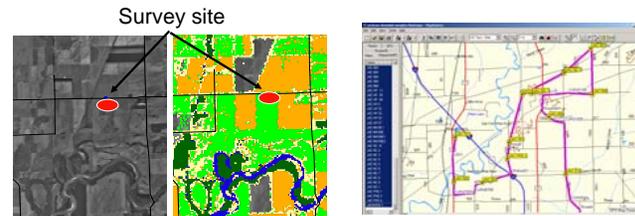


Figure 2. State map showing the counties sampled in 2003 (left) and 2004 (right) and number of sample sites in each county. The 2003 map also shows the specific sample locations (grey dots).



Digital aerial imagery of Jackson county, IN developed by the US Geological Service.

Cropland Data Layer of Jackson county, IN developed by the US Agricultural Statistical Service.



Cropland Data Layer of Jackson county, IN developed by the US Agricultural Statistical Service

A screen picture of the route map developed and followed in the survey of Jackson county. JAC 001 was a random site, while JAC PRE 2 and JAC NC 2 were sites selected during the trip based on the visual presence of horseweed.

Figure 4. Images and information used to develop survey site map for Jackson county, IN.

## Discussion

In 2003, survey efforts concentrated primarily in the SE corner of Indiana as this was the area with confirmed populations of resistant horseweed (Figure 2). We also selected pairs of counties in other parts of Indiana for sampling based upon contrasting levels of no-till acreage (Figures 3). We were able to survey 782 sites throughout Indiana (Figure 2). From the 782 survey sites, 392 samples of horseweed were obtained and 203 showed some level of glyphosate tolerance.

In 2004, survey efforts were concentrated in counties surrounding the southeastern region (Figure 2). We surveyed 324 sites and collected 62 horseweed samples. Glyphosate screening efforts will be completed soon, and county maps similar to Figure 5 will be available on the website by May 2005.



Figure 6. Purdue Horseweed Website [www.btny.purdue.edu/weedscience/marestail/index.htm](http://www.btny.purdue.edu/weedscience/marestail/index.htm)

## Pertinent References

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