Bird damage to blueberries.

Economic Impact of Bird Damage

- Study results indicate that annually, NY loses an average of $16 million due to bird damage to the five fruit crops in the study, with a corresponding employment loss of about 500 jobs.
- The annual benefit of managing bird damage was estimated. Bird management prevents between $25 million and $28 million in losses to grower revenue in NY.
- Bird crop damage management also prevents employment loss across the economy. In NY, unmanaged bird damage would cause a $34 million dollar loss in output and result in over 1,200 lost jobs.
- Average current damage per acre ranges from $93 in wine grapes to $2,103 in sweet cherries. Per acre management benefits range from $509 in wine grapes to $3,384 in apples.

The Economic Impact of Bird Damage to Select Fruit Crops in New York

Funding provided by USDA's Specialty Crop Research Initiative

Summer 2014

Bird damage is a persistent problem faced by fruit growers. The economic impact of bird damage and the value of bird management are poorly understood, particularly for fruit crops. In 2012, funding was provided by USDA's Specialty Crop Research Initiative to perform an interdisciplinary research study of bird damage to 'Honeycrisp' apples, wine grapes, blueberries, and tart and sweet cherries in five states: California, Michigan, New York, Oregon, and Washington.

Bird damage to apples, a high-value crop.

Objectives of the economic analysis of bird damage were to:

- Survey fruit growers to assess current bird damage levels and the effectiveness of management techniques.
- Calculate the monetary value of crops lost to birds and the benefits of management.
- Estimate the economic impact of bird damage to the regional economy in each state in terms of changes in output and employment.

The average annual economic impact to New York from bird damage to the study crops is $16 million with the loss of almost 500 jobs.

Fruit growers estimated their 1) yield loss in 2011, 2) yield loss if they did not use any bird management techniques, and 3) yield loss if they and their neighbors did not use bird management. These estimates were used to calculate the value of crops lost to birds, and a low and high estimate of the economic benefits of current bird management. Additionally, impacts to the broader economy from damage to crops and the savings associated with bird management were estimated using a model of the regional economy that predicts how a change in one industry can affect revenue and employment throughout the economy. These results illustrate how crop loss affects the region's economy.

Table 1. Annual revenue impact of bird damage and the benefits of bird management in NY.

	Blueberries	Wine Grapes	Honeycrisp Apples	Sweet Cherries	Tart Cherries
Current Damage	-$585,753	-$3,452,595	-$1,373,583	-$1,188,371	-$261,530
Benefit (low estimate)	$2,022,599	$18,865,963	$2,396,463	$1,067,263	$945,958
Benefit (high estimate)	$2,137,747	$20,592,260	$2,951,741	$1,347,325	$1,029,425

Grapes hanging behind bird netting.

Research Background

This study is a multi-state research project focusing on the biological, economic, and consumer impacts of bird damage to fruit crops. Taking place in Michigan, New York, Oregon, Washington, & Northern California, the initiative focuses on blueberries, cherries, wine grapes, and Honeycrisp apples. The objectives are to identify which birds are fruit pests, the best methods to manage bird damage, and how bird damage management could influence marketing. Detailed economic analysis reveals the significant economic impact bird damage has on fruit farms, consumers, and the regional economy.

Research Affiliates:

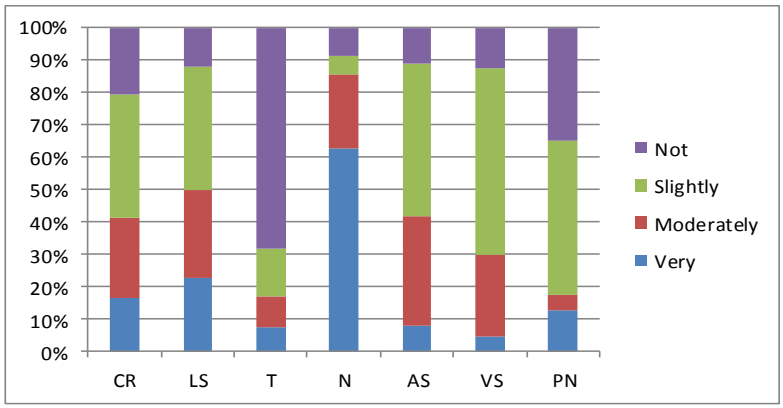
- Michigan State University
- Cornell University
- Trinity Western University
- Washington State University
- Oregon State University
- USDA/APHIS/WS National Wildlife Research Center

For more information, visit birddamagetofruitcrops.info

Bird Damage Management Techniques and Their Perceived Effectiveness

Growers use a variety of bird management tactics to combat crop loss. The use of a given management technique is dependent on the crop, region, and depredating species and may change over time.

Figure 1. Effectiveness of bird management techniques as reported by growers in New York.



Data Collected from New York Fruit Growers

A survey administered by Cornell University's Human Dimensions Research Unit queried growers to collect data on the five crops in the study within MI, NY, OR, WA and CA, with results reported separately for each crop. Questions asked for demographic information, growers' experiences with bird damage, which bird management techniques they were using, and how effective they believe the methods are. Table 2 displays select survey results.

General Survey Results

- 1,590 survey respondents grew at least one of the five crops in the study. Of those, 396 (25%) were in NY.
- 68% of NY respondents reported taking some action to manage bird damage.
- Most survey respondents in NY said wine grapes (39%), blueberries (23%), or Honeycrisp apples (21%) were their most important crop.

Bird Damage in New York

- The cost of bird management was highest for wine grapes followed by sweet cherries and tart cherries.
- Reported crop yield lost to birds was between 5% (Honeycrisp apples) and 31% (sweet cherries).
- Without management, NY growers expected birds to damage up to 67% of their crop.

Table 2. Survey results from New York fruit growers.

Crop	Percent Respondents Growing Crop	Yield per Acre*	Annual Bird Management Costs	Percent Lost to Bird Damage		
				Current	No Management (Low estimate)	No Management (High estimate)
Wine Grapes	37%	5.11	$1,570	6%	36%	39%
Blueberries	29%	5,191	$404	12%	52%	54%
Tart Cherries	11%	7,260	$510	9%	43%	47%
Sweet Cherries	22%	3.40	$692	31%	60%	67%
HC Apples	35%	679	$249	5%	13%	15%

Note that outliers have been removed for percent lost to bird damage and yield per acre in this table.

*Yield per acre units: grapes = tons, blueberries = lbs, tart cherries = lbs, sweet cherries = tons, apples = bushels

Management of Birds in Cropping Systems

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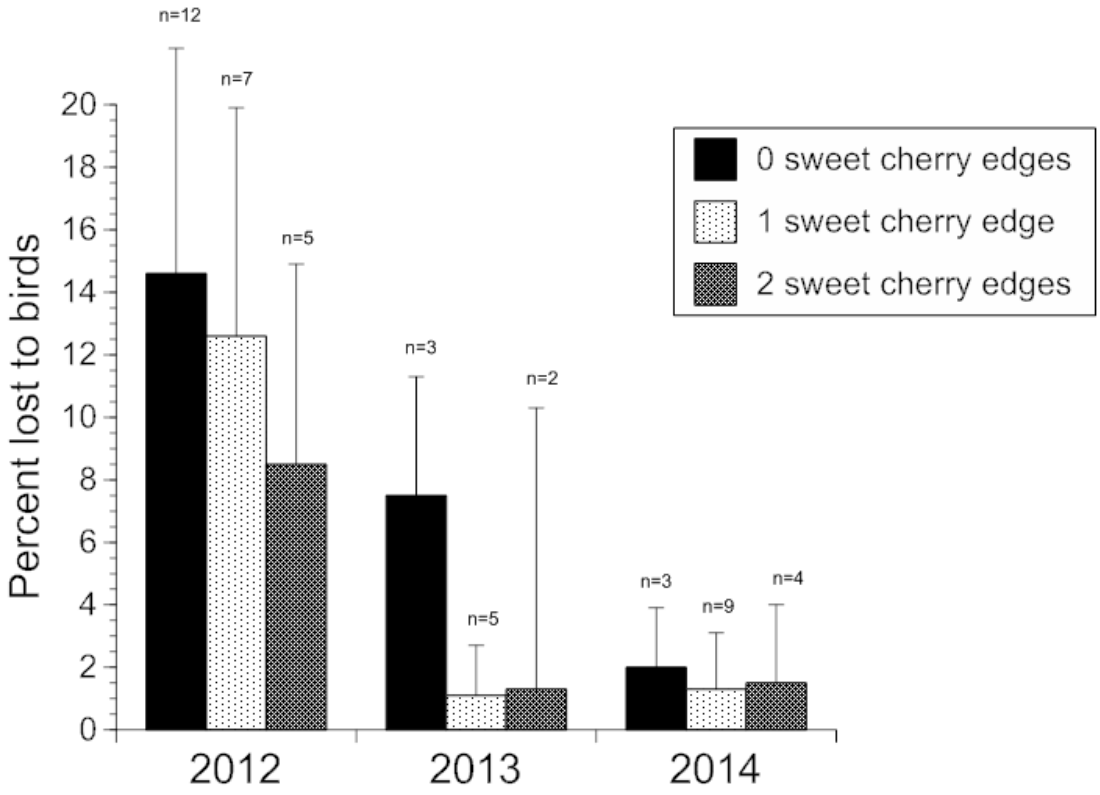
Risk factors for high crop damage by birds.

A. When there is less fruit or vegetables in a given area, there will be higher percent bird damage to the crop that is available. When/where to expect higher percentages of damage: 1) low-yield years (for example 2012 in Michigan sweet cherries, **Figure 1**), 2) early-ripening varieties.

B. Blocks near resources important to birds are at higher risk for damage. When/where to expect higher damage: 1) blocks under wires, 2) edges of blocks not adjacent to other blocks (**Figure 1**), 3) near night roosting sites, 4) isolated blocks with little human activity, 5) potentially blocks near dairy farms.

Figure 1. Michigan sweet cherries had higher percent bird losses in 2012 although this effect varied with the number of block edges adjacent to other sweet cherry blocks. In other words, blocks near other blocks are protected to some degree from bird damage.



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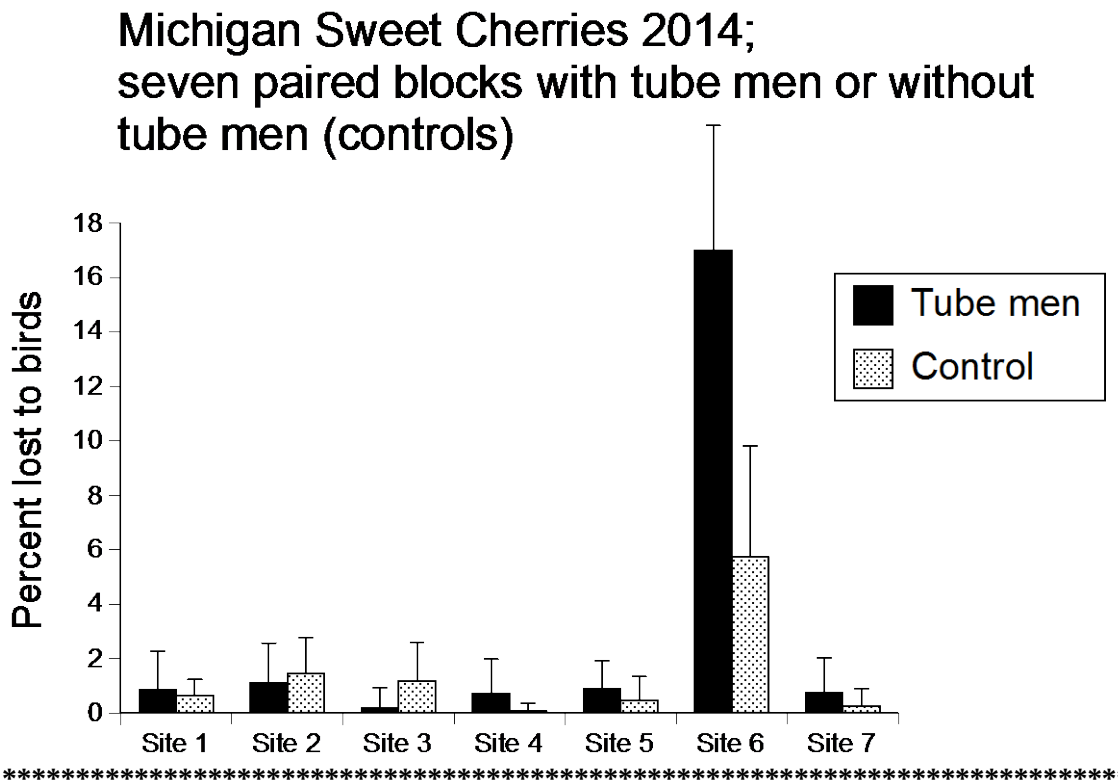
The actual **numbers** of fruit lost to birds were relatively constant in six Michigan sweet cherry orchards we sampled in 2012-2014 (**Table 1, columns 2-4**). Because the fruit yields were much higher in 2013 and 2014 (as indicated by the number of fruits sampled; **Table 1, column 5-7**) than in 2012, the **proportion** lost was much higher in 2012.

Table 1.

Block	Number of fruits lost to birds			Number of fruits sampled		
	2012	***2013***	***2014***	***2012***	***2013***	***2014***
1	33	51	34	184	2703	4521
2	45	100	89	1031	3218	8220
3	18	43	29	44	517	3292
4	0	3	6	5	308	1979
5	52	39	46	559	3572	11416
6	6	25	13	462	3495	6211

Therefore, in high-yield years, bird management may be less critical than in low-yield years. Bird management also may not be very effective in high-yield years. In 2014, for example, with high sweet cherry yields, the percentages lost to birds in orchards with and without inflatable tube men were generally low and similar (**Figure 2**).

Figure 2.



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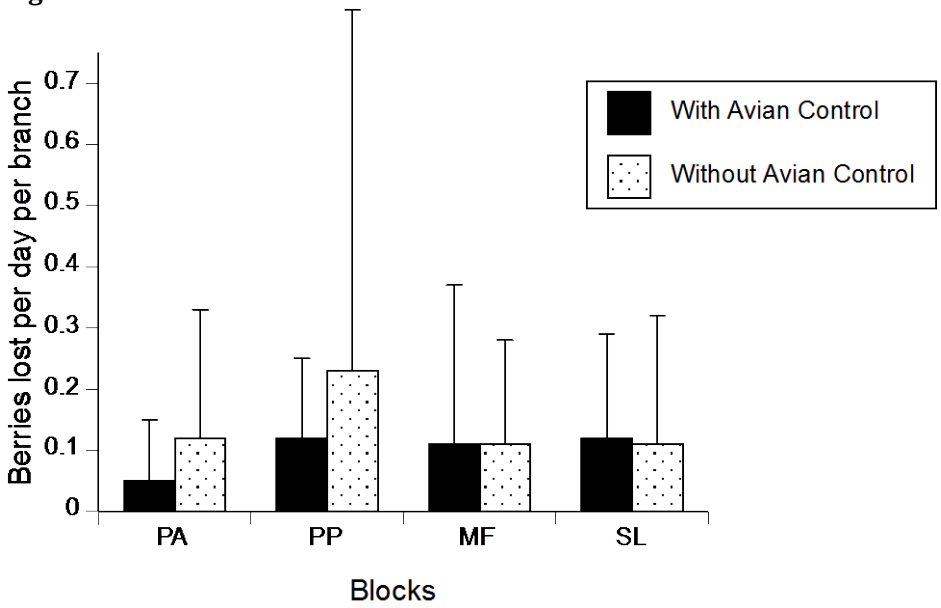
In 2015 we cooperated with a blueberry grower who sprayed half of 4 fields with Avian Control before harvest and left the other half unsprayed. We sampled approximately 40 canes from each half of the four fields for a total of approximately 320 canes sampled. We counted berries on each cane approximately three weeks before harvest and again 2-3 days before harvest. We did not detect a statistically significant difference in the number of berries lost per day in the sprayed vs. unsprayed halves of the fields (**Figure 3**).

Figure 3.



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Considerations in development of bird management strategies.

Each farm is unique and should be assessed for risk factors like wooded edges that provide "staging areas" for crop-eating species like American robins.

Some deterrents, like lasers, work in particular situations. For example, lasers deter Canada geese in low-light situations. However, lasers are not likely to deter many of the pest birds seen in crops during the day.

Using multiple scare deterrents, deploying them early in the growing season, and moving them frequently should enhance their effectiveness in deterring birds.

Netting, when done with frames and with care to make sure netting reaches the ground, is generally effective against birds.

Providing nest boxes for predatory birds will increase the presence and activity of these beneficial birds in orchards. The most common predatory bird, the American kestrel, preys on rodents, insects, and small birds. These types of biodiversity-friendly pest management strategies may be useful in marketing.

Acknowledgments.

U.S.D.A. Specialty Crop Research Initiative, many state fruit grower industry groups, Avian Control Inc., fruit growers in Michigan, New York, Oregon, Washington, and California.

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