# Evaluating Direct and Indirect Economic Outcomes of the 2008 Iowa Weather-Related Disasters

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# Contents

# Introduction

How did the floods of 2008 and other coincidental natural disasters affect the well being of Iowa's households, businesses, and the governments they depend on?

State of Iowa officials have diligently compiled descriptions of the damages and counts of the commercial and household victims, the value of the losses, to the degree they were reported, and the broad array of public costs that have been allocated in response to the floods of 2008. Notwithstanding the detailed quantification of the disaster consequences, there is still no one number that describes the full impact of the events of 2008 for the state's economy, nor should readers expect one.

There are two reasons for this. First, there is no complete and reliable tally of all of the net losses that were borne by both the private and public sectors. We do not know the full value of asset losses experienced by households, businesses, and the public as a result of the disasters; nor do we know the fraction of those losses that were offset by public and insurance reimbursements and other forms of assistance by private regional social and charitable services. We do not know the value of private sector indemnity payments to households or firms; nor do we know the amount of loss borne by firms that were self-insured and did not seek assistance. In other words, it is not known, on a measurable basis, how worse-off individuals, firms, or society are after all private and public compensations were made.

Second, there is no reliable summary of the value of industrial or public sector productivity reductions that resulted from the disasters or of changes in aggregate household consumption of goods and services. The floods and related events diminished the productivity of the private sector in parts of Iowa, and it interfered with the distribution and enjoyment of private and public goods in many places, but the duration and magnitude of these interruptions to private and public sector productivity or household consumption cannot be quantified on an aggregate, statewide basis. Without confident estimates of those reductions, there are no statewide economic consequences to declare at the outset. (See especially Mattoon, 2008, for a good discussion of the kinds of quantifiable consequences to be expected from disasters. See also, Swenson, Eathington, and O'Brien, 2008, for a similar discussion as applied directly to Iowa's situation).

This research seeks to fill some of the gaps in understanding the local, regional, and statewide economic consequences of the disasters of 2008. In this report we evaluate sets of population, unemployment, employment, business firms, and trade patterns over time in an attempt to discern the household consumption and business productivity disruptions caused by the weather disasters of 2008.

## Quantifying the economic consequences of disasters

There are three standard measures that allow us to reliably characterize the physical and financial consequences of a natural disaster: damages, losses, and costs (National Research Council, 1999).

It might be assumed that economists can reliably and simply aggregate the damage and loss declarations from a disaster and then apply an economic multiplier to that value, yielding a final determination of all job and income consequences of the disaster. Unfortunately, that is not the case.

Many people use the term "economic impact" generically to describe the economic consequences of an event, but the type of economic impact assessment that involves the use of multipliers or complicated modeling systems has a much more precise meaning. In this study, economic impact refers to changes in regional consumption or regional production. Measuring both of these requires a much different approach than the typical damage, loss, and cost measures we use to account a natural disaster for the purposes of distributing state or federal assistance.

## Damages, losses, and costs

The three standard measures used for accounting a disaster – damages, losses, and costs – all refer to dimensions of tangible and intangible losses in property or public goods and the recovery payments that are received via insurance indemnity and public assistance. State and federal officials compile as complete estimates and descriptions of these categories as are possible via their state and federal reporting systems. The three measures are defined in greater detail below.

| Disaster Accounting Measures | |
|---|---|
| **Damages** | Damages describe the physical outcomes of the events: houses destroyed, roads damaged, bridges washed out, crop land eroded, households affected, and businesses disrupted, as examples (see especially, Mutel, 2008, for an excellent survey of the scope of damages). |
| **Losses** | Losses are estimates of the financial value of the damages, to the extent that they can be determined. Losses are only known to the extent that individuals, businesses, or governments itemize those losses when seeking assistance. Many losses go undocumented. There are countless personal household items that have no tangible value. Similarly, degradation of public spaces cannot be quantified in the market readily.<br><br>Importantly, losses represent the fair value of the items that are enumerated, not the replacement cost of the items. For example, if a home was damaged in a flood and condemned, but would have only fetched $75,000 in the market before the flood, one cannot claim that the loss is the replacement cost of re-constructing that home in a modern market at, say, $150,000. The loss would be $75,000.<br><br>There are two types of losses to consider: direct and indirect. *Direct losses* include, for example, a destroyed home and personal belongings or, perhaps, the destruction of business machinery or inventory. *Indirect losses* might include incomes derived from a business that was affected, lost wages to displaced workers, or even the increased costs to households, commuters, or firms because their life or business circumstances change. These indirect consequences are extremely difficult to measure, and often lend themselves to exaggeration as the evaluators are likely to mistake, for example, the value of lost sales as lost personal income. Federal disaster officials primarily scrutinize direct losses and are, for good reason, somewhat indifferent to exhortations of indirect economic consequences. |

| | |
|---|---|
| **Costs** | Costs measure the payments by insurers, to the extent that the natural disaster losses were insured, and payments by the public at large to directly repair or compensate persons, firms, or public entities that had losses.<br><br>Significant portions of costs are socialized across all U.S. taxpayers in the form of federal, primarily, aid and assistance. Not all losses are compensated, however, so there ultimately is a gap between the declared value of the losses and the value of the payments to households, businesses, and industries. The very nature of a natural disaster will leave victims, in the aggregate, worse off than before the disaster. |

## Economic Impacts

Whether we are describing a disaster or any other disruption to the economy, there are two key interacting factors which properly translate into measurable economic impacts using traditional modeling systems. These are the annualized changes in regional household consumption, or regional industrial production. If a disaster displaces people or otherwise interferes with their abilities to obtain incomes, then regional consumption will decline. Similarly, if a disaster interferes with the capacity of a region to produce goods and services, then regional productivity will decline, which in turn depresses jobs and job-related incomes. One or both of these dimensions must be measured before an economic impact declaration can be made. In so doing, researchers must pay attention to the following factors:

***Shifting.*** Researchers must be mindful that disruptions in households or business activity must be calculated net of all intra-regional shifting that may have occurred. Lost business productivity in one part of a community may be adequately made up by increased productivity in another. Many damaged businesses may be somewhat footloose and able to relocate locally with minimal disruptions. A region's housing stock may be adequate to absorb localized losses without impelling outmigration.

***Offsets.*** And last, disaster recovery results in a short term, albeit potent, flow of social assistance and disaster-recovery payments which in turn boost overall regional consumption as well as economic activity broadly. Sorting out impact boosts from impact losses is virtually impossible as the two are being realized simultaneously during the early months of recovery.

***Data Availability.*** Carefully constructed surveys might be used to confidently infer household consumption changes and business production changes to the larger population of afflicted entities. Surveys, however, are very expensive and difficult to administer in the aftermath of disasters, especially when households must relocate or firms become irrevocably damaged.

In the absence of reliable, directly collected data on either household consumption changes or business productivity adjustments, it is necessary to use secondary data to identify measurable potential economic impacts.

## The Long Process of Measuring Iowa's Disasters

In the immediate aftermath of Iowa's storm and flood events, which peaked in June that year, there was a scramble by local and state officials along with business interests to begin the arduous process of quantifying the economic consequences. Using rudimentary extrapolations from very limited data, dire statewide economic outcomes were initially proclaimed. The American Farm Bureau, as one example, announced there were $4 billion in agricultural crop damages in Iowa alone (Conlon, 2008; Matton, 2008). Another $4 billion in commercial damages were estimated by Iowa state government officials by July, 2008, which when coupled with anticipated household losses put Iowa's presumed losses in the neighborhood of $10 billion (Insurance Journal, 2008).

The loss estimates began to temper over time. A report issued by the Rebuild Iowa Advisory Commission (RIAC) in September 2008 (RIO 2008) summarized the scope and amount of losses from the weather events. Data from that report concluded the disasters resulted in preliminary losses of $3.5 billion (see Table 1). Given all of the information available to evaluators at the time, the 45-day quantified losses were significantly lower than the amounts feared shortly after the events, particularly in the agricultural sector (Otto, 2009).

**Table 1**

September 2008 Weather-Related Loss Estimates

| Category | Amount in Billions |
|---|---|
| Housing and business structures | $1.3260 |
| Infrastructure | $.6610 |
| Educational facilities | $.2974 |
| Cultural and historic landmarks | $.2845 |
| Agriculture and the environment | $.9294 |
| Total estimated losses | $3.4983 |

Federal, state, and local officials continue to compile data on the damages, losses, and costs of the disasters at this writing. The clearinghouse in Iowa for quantitative and qualitative descriptions of flood consequences is the Rebuild Iowa Office (RIO), and readers are urged to consult that department's web site for up to date summaries of recovery activities.[1] As to the major consequences of the Iowa disasters of 2008, according to the RIO website:

- 39,828 persons filed for FEMA assistance, which is about 1.3 percent of the state population.
- 23,289 households received some type of housing assistance
- $161 million in SBA loans were approved for homeowners, and $112 million in loans were approved for businesses

[1] The authors received assistance from the Small Business Administration, the Rebuild Iowa Office, and the U.S. Economic Development Agency with earlier disaster-related investigations and preliminary data collection.

- $848 million in FEMA and other federal public assistance was approved to offset personal, business, and primarily government recovery costs

The RIO compilations or their publicly available materials do not tell us information related to lost regional or state productivity, however, like:

- How many businesses by which types were damaged by the weather incidents, the mean duration or type of business disruption, losses in business productivity among affected business for that year, or the number of businesses that failed solely because of the disasters, whether in the immediate aftermath or later

- The flood related consequences to households, to include changes in household consumption and their abilities to generate household income

In short, while there is a tremendous amount of categorical information about government responses and where the victims were and how many, very little of the data needed to arrive at some type of productivity-altering economic impact conclusion about the weather events' broad economic consequences have been compiled or in fact could be compiled. Much of the data simply are not available to government investigators without extensive and expensive surveys of business and household victims.

### But haven't impact summaries been done?

Cities across Iowa have compiled estimates of the consequences of the natural disasters to include counts of businesses damaged or closed and initial estimates of the number of lost jobs in those firms. The City of Cedar Rapids, for example, recently commissioned an economic impact report to quantify its regional economic losses to support its case for increased federal funding of its flood recovery plan (Robinson, 2010). The City of Cedar Rapids declared a loss of 1,845 permanent and part-time jobs, and by applying an industry-wide Linn County series of multipliers that report concluded slightly over 3,500 permanent jobs were lost due to the flooding in the Cedar Rapids economy.

This may seem feasible to the lay person given the magnitude of the flood, but that finding is contradicted by the fact the metropolitan Cedar Rapids economy actually posted a 1.8 percent increase in employment in the flood year compared to the year previous (see Figure 28), and the metropolitan area at large closed out 2008 with a 5.8 percent expansion in Gross Domestic Product, which was significantly better than the state of Iowa's 4.4 percent increase, which in turn was significantly better than the 3.3 percent growth the nation posted.

Concluding a city permanently lost a set number of jobs based on a simple survey of affected businesses is premature, as it does not represent a comprehensive, region-wide accounting of the disaster. As will be demonstrated, regional economies are not static. Service and retail sales will shift into areas that were not damaged. Ongoing service firms that can will either temporarily or permanently re-locate elsewhere. Industrial production, while impeded for a time, might very well have had strong incentives to make up production losses by increasing production for a time over and above the norm. And lastly, disaster clean-up, recovery, and rebuilding stimulated a strong demand for workers. The upshot is that

studies like these should not be interpreted as having measured net regional productivity losses as they are not a comprehensive evaluation of all regional economic changes, shifts, and offsets associated with the disaster.

### Contributions of this report

This study does not replicate RIO efforts or otherwise audit their data compilations or those of others; instead, it is an evaluation of many different sets of direct and indirect economic consequences that will help to provide research-based conclusions about the magnitude and types of economic disruption and offsets to that disruption that emanated from the natural disasters of June, 2008. It puts an array of government agency data into categorical and spatial perspective, and it looks at other sets of direct and indirect economic data to help sort out flood related consequences in Iowa. The report contains the following sections:

**Section 1** begins as a description of the geography of the disaster, and isolates areas with the greatest concentrations of losses, both in absolute terms and per capita using a set of measures to arrive at a determination of high, medium, and low impact counties. Next, this section extensively explores indirect economic data to isolate and describe the employment, unemployment, job creation, business establishments, retail trade, school enrollment, and population consequences that may be attributable to the disasters by level of impact. This section will demonstrate that statewide economic productivity, by most measures, only show minor alterations coincident with the period of disasters and immediate aftermath, and that no longer-term and lasting demographic consequences are evident.

**Section 2** presents, using impact modeling techniques, sets of regional business productivity loss scenarios. These scenarios describe reductions in retail trade, accommodations and dining services, rental housing, and in grain processing and other value added manufacturing that was typical of the industrial disruptions in the areas with the greatest flood impacts. This section provides perspective as to the potential value of regional losses due to shut-downs or periods of reduced productivity. It does not arrive at a conclusion as to the sum of all productivity disruptions as reliable measures of those disruptions have not been compiled by state agencies or communities. A brief discussion of potential property tax losses is also included.

**Section 3** explores the agricultural sector in Iowa and, using impact modeling techniques, identifies the potential losses that could have accrued to agriculture were there no compensating disaster-related indemnity payments from insurers or federal disaster aid.

**Section 4** describes, using impact modeling techniques, the short term job and labor income sustaining values associated with flood cleanup, repair, maintenance, and rebuilding of public infrastructure, businesses, and homes. It will also put statewide economic impact values to the funds that helped directly support households and the provision of public services. This section will summarize those publicly-funded outcomes and their short-term positive impacts on the Iowa economy.

# Section 1 – The geography, magnitude, and indirect economic consequences of the weather-related events

Iowa's weather events of 2008 affected a large fraction of the state, with 85 of 99 counties receiving Presidential disaster declarations. These events destroyed homes and household possessions, interfered with business and industrial production, impinged on many workers' abilities to participate in the workforce, and altered cropping decisions and crop yields.

To the extent that the disasters had significant and lasting impacts on the state's economy, those impacts should be most evident in the counties that sustained the highest degree of weather-related damage. This section uses an array of economic measures to compare and contrast the experiences of counties that sustained comparatively high, moderate, and low levels of damage from the storms and floods of 2008.

## Geography of loss

Data from selected federal disaster assistance programs were used to determine which areas of the state experienced the highest levels of weather-related damages and losses. Each county's losses to households, local governments, businesses, and farmers were standardized on a per capita or per square mile basis to evaluate the intensity of their losses compared to the statewide average. Figure 1 illustrates the relative concentrations of loss in each of the four measured categories: (1) losses to households; (2) public sector losses; (3) losses to business establishments; and (4) crop losses. The derivation of these loss measures are described in more detail below.

**Household losses**. Household losses were approximated using the dollar amount of payments received under the FEMA Individuals and Households Program, more commonly referred to as "Individual Assistance." This program provides housing and other needs assistance grants to renters and homeowners with eligible, disaster-related damages. Also included in the household loss measure was the dollar amount of real estate losses verified under the Small Business Administration's Disaster Loan program and uninsured losses that were declared by Iowa state income tax filers for 2008. The household losses by county were standardized on a per capita basis.

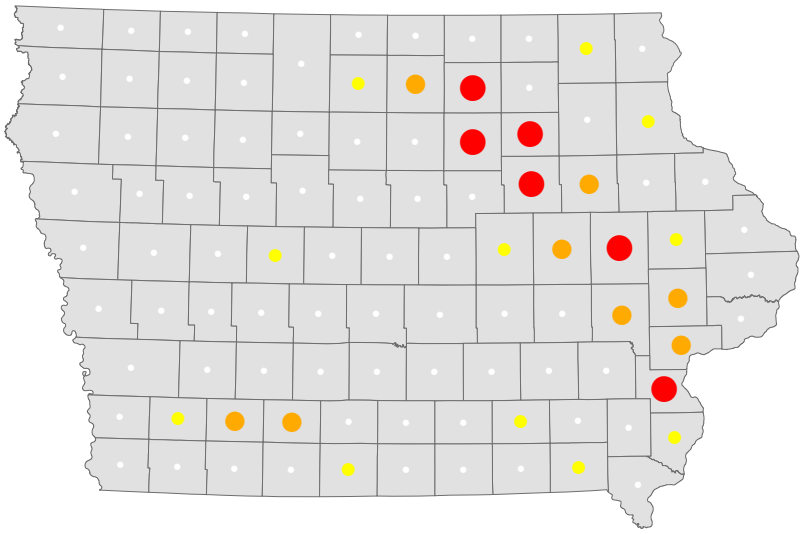
**Public Sector losses**. Losses to public sector were measured by the dollar amount of payments received under the FEMA Public Assistance Program, the FEMA Hazard Mitigation Program, and payments from the U.S. Department of Transportation for repairs to transportation and railroad infrastructure. The public sector losses by county were standardized on a per capita basis.

**Business losses**. Losses to business establishments were measured by the dollar amount of real estate and other losses verified under the Small Business Administration's Disaster Loan program. Business losses by county were standardized on a per capita basis.

**Crop losses**. Losses to farmers were measured using the dollar amount of crop peril payments by county. These losses were standardized on a per square mile basis.

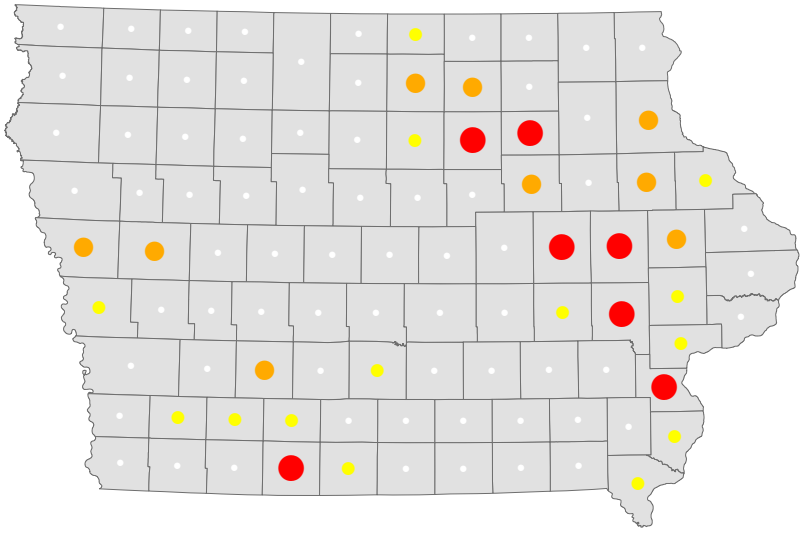
**Figure 1**

## Households



FEMA Individual Assistance and Other Needs Payments and SBA Verified Home Losses Per Capita

## Public Sector

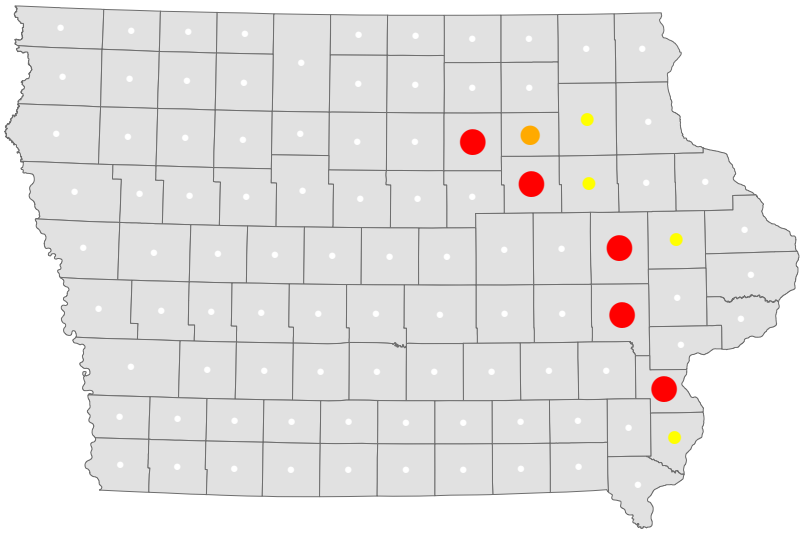


FEMA Public Assistance and Hazard Mitigation Payments and DOT Payments Per Capita

**Loss Intensity Ratio**
(Standardized Losses Relative to Statewide Average)

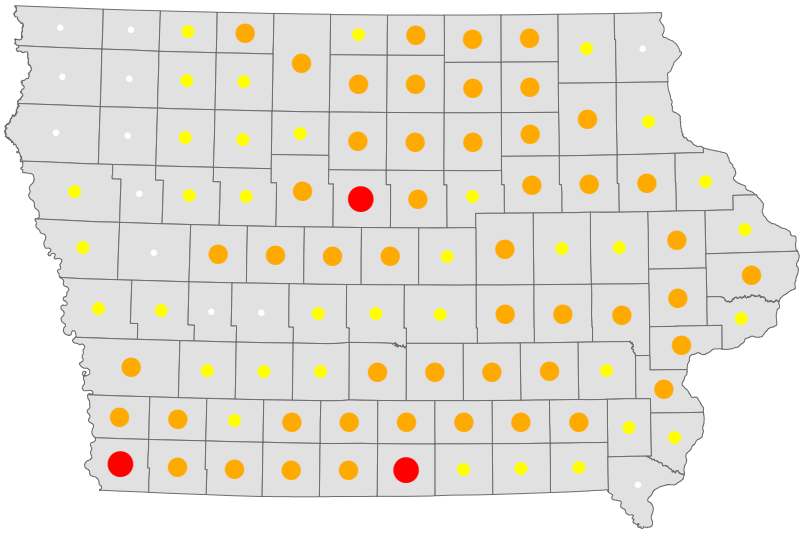
Under 1/2 | 1/2 to 1 | 1 to 2 | 2 or more

## Businesses



SBA Verified Losses Per Capita

## Agriculture



Crop Peril Payments Per Square Mile

**Loss Intensity Ratio**
(Standardized Losses Relative to Statewide Average)

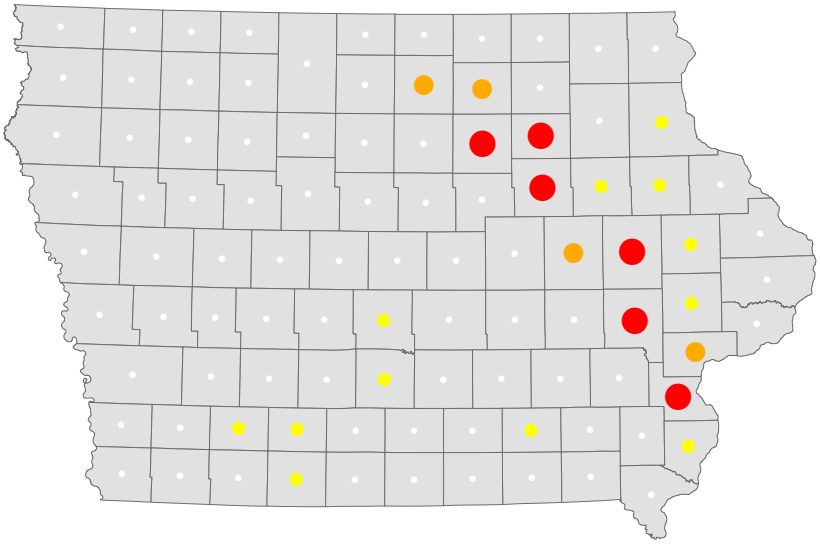
Under 1/2 · 1/2 to 1 · 1 to 2 · 2 or more

The categorical losses to households, local governments, businesses, and farmers were combined and weighted to derive an overall loss intensity ratio for each county. The weighting procedure ensured that counties experiencing isolated but high value losses did not overshadow counties whose losses were spread over multiple sectors of their economy. Because the patterns of crop loss deviated so strongly from the other categories, however, losses to farmers received a lower weight. The weighted loss measures were used to create the county groupings illustrated in Figure 2.

Any county with an overall loss intensity that exceeded the statewide average (a loss intensity ratio of 1 or more) was classified as a "High Impact" county. A subset of those counties, where the loss intensity was twice or more than the statewide average, was classified as "Very High Impact" counties. Counties with a relative loss intensity that was 50 to 100 percent of the statewide average were classified as "Moderate Impact" counties. The remaining counties, whose loss intensity measured less than half of the state average, were classified as "Low Impact" counties.

**Figure 2**

Weighted Loss Index for All Categories

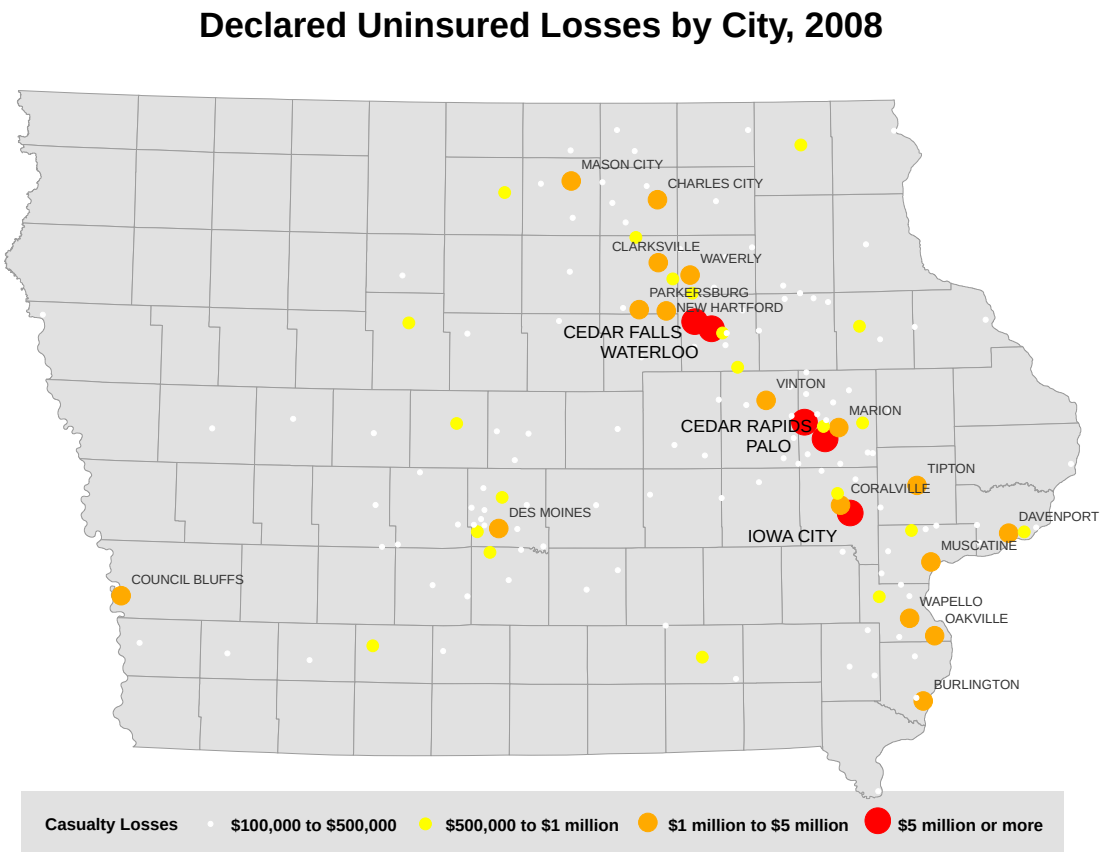


| Impact Group | Number of Counties | Shares of Statewide Losses* | | |
|---|---|---|---|---|
| | | Household Losses | Public Sector Losses | Business Losses |
| Very High | 6 | 77% | 74% | 93% |
| High | 4 | 7% | 5% | 1% |
| Moderate | 12 | 9% | 9% | 4% |
| Low | 77 | 8% | 11% | 2% |

** As documented by selected federal disaster assistance programs*

The following six counties fall into the "Very High Impact" category: Black Hawk, Bremer, Butler, Johnson, Linn, and Louisa. Four counties fall into the "High Impact" category: Benton, Cerro Gordo, Floyd, and Muscatine. The 10 high impact counties contain several cities that experienced extensive weather-related damages including Cedar Rapids, Palo, Iowa City, Coralville, Cedar Falls, and Waterloo. Other cities sustaining high levels of damage are illustrated in Figure 3. These cities were identified using declared uninsured losses on state income tax returns for the 2008 tax year.[2]

Figure 3



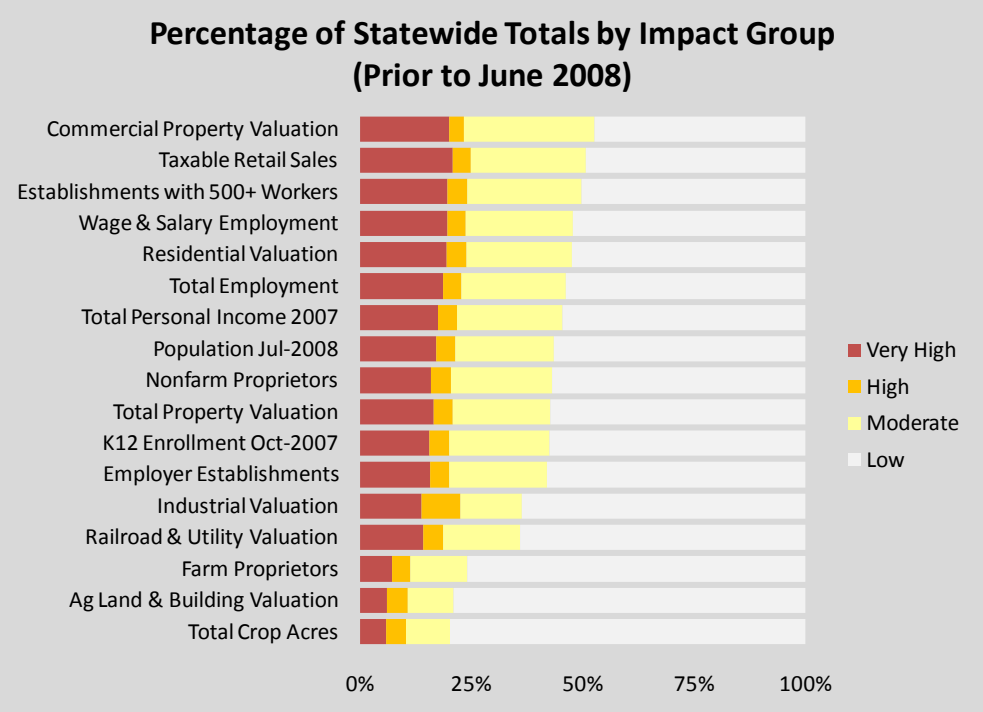

Combined, the 10 high impact counties accounted for 84 percent of measured household losses; 79 percent of losses to public buildings, parks, roads, and other infrastructure; and 94 percent of documented losses to businesses.

The 12 counties in the moderate impact group accounted for 9 percent of household and public sector losses and 4 percent of business losses. The remaining 77 counties in Iowa combined for an 8 percent share of household losses, 11 percent of public sector losses, and just 2 percent of documented business losses.

[2] These are declared losses for the entire tax year and include losses that were not weather-related.

Figure 4 illustrates the pre-disaster distribution of the state's commercial, residential, and industrial base across the four county impact groups. This chart provides some perspective on the overall importance of the high impact counties to the state's economy. Combined, the two high impact county groups accounted for nearly one quarter of the state's residential and commercial property valuation, wage and salary employment, and taxable retail sales.

Figure 4



## Indirect impact indicators

The actual extent of disaster-related disruptions across Iowa's counties cannot be known without identifying all disaster-affected individuals and businesses and then systematically compiling their household specific and establishment specific data – a monumental and infeasible task that was not undertaken by the state of Iowa. Reliable approximations can be made with the use of surveying statistically valid samples of households, businesses, and farms, but again the state of Iowa did not engage in such an undertaking. As a substitute, we use several indirect measures of economic and social outcomes to gauge the degree to which deleterious market and community outcomes were the result of the tornadoes, wide-spread inundation, the floods, and the resulting aftermaths.

### Population

Natural disasters frequently result in the temporary or permanent displacement of residents from their communities. While isolating these population losses from normal out-migration flows is not possible, we can examine recent trends in population measures to look for obvious disaster-related consequences.

#### *Total population*

Figure 5 shows recent population trends by county group using annual population estimates from the U.S. Census Bureau. These estimates, which describe the resident population size on July 1st of each year, are based on vital statistics including births and deaths, migration flows derived from IRS data, and other administrative records.

The populations in the high impact counties posted annually higher increases through the flood year and a slight tapering of their numerical increase in the last year of measurement change, 2008 to 2009. Moderate impact counties' amounts of increase had been trending downward slightly, and there is no evidence of a meaningful change in that pattern during the flood year. Low impact county changes are much smaller than the other two groups and demonstrate a numerical growth trend from the year previous to the weather events to the last measurement year.

Figure 5

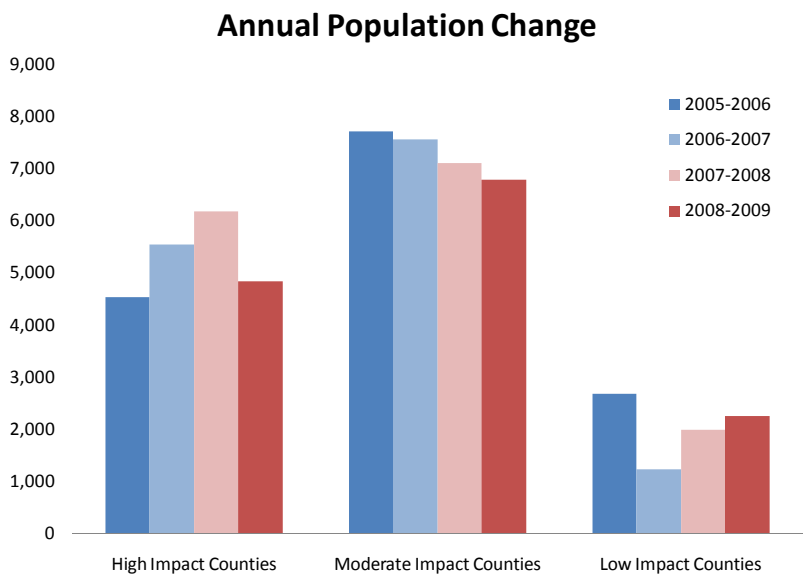
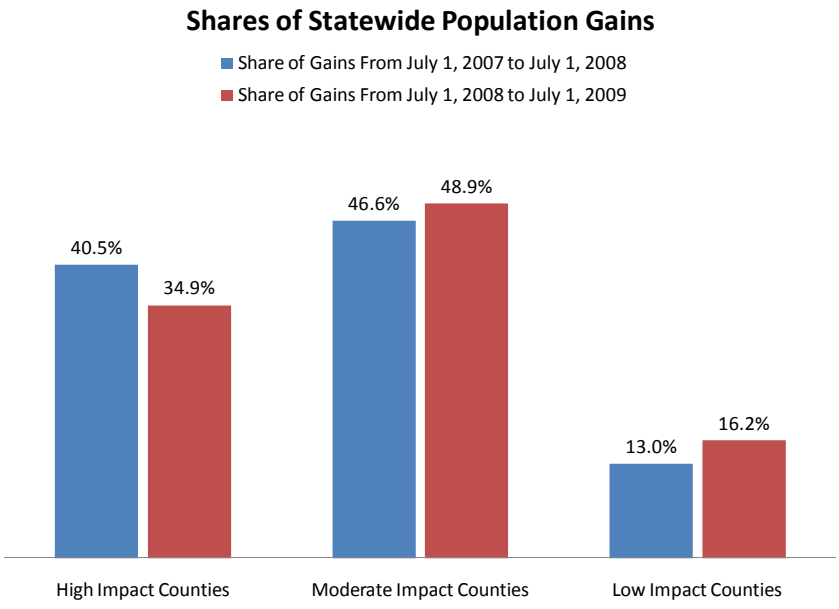



Figure 6 provides an alternative measure of population changes by looking at the share of the state's gains commanded by each county group before and after the flood period. The high impact counties accounted for 40.5 percent of state population gains during the year preceding the disasters, but their share of statewide population growth during the year after dropped to 35 percent. Moderate impact and low impact counties' combined shares of growth, by definition, made up the difference.

Figure 6



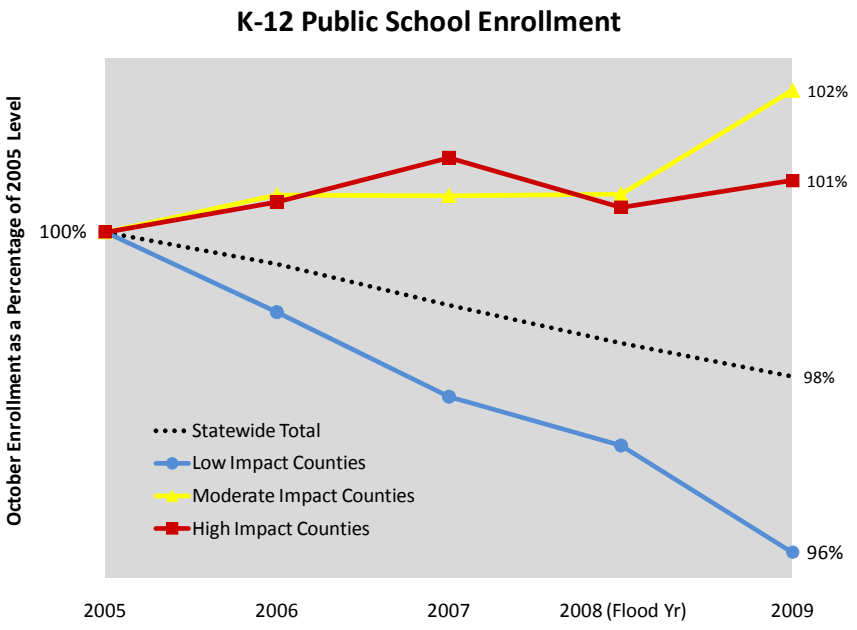
### *School enrollment*

When public school enrollment levels deviate from their longer-term trends, it may be an indication that families are migrating into or out of the region. Figure 7 illustrates recent trends in the estimated number of K-12 students statewide and for the three county impact groups. Values for each year are shown as percentages of 2005 enrollment levels. Data for individual school districts have been apportioned to counties based on the actual residence of students.

In October of 2008, Iowa's public schools had nearly 2,100 fewer students enrolled in grades K-12 compared to the previous year; however, this decline was consistent with a longer-term trend in the state's K-12 enrollment.

The high impact counties realized a slight drop in enrollment for the 2008 school year, which marked a reversal of their recent upward trend. Enrollment in the high impact counties declined by 0.6 percent between 2007 and 2008, but then rebounded slightly from 2008 to 2009. The moderate impact counties did not experience an aggregate enrollment decline in the period prior to the events, but they did see their enrollments boosted in the last year measured. Enrollment in the low impact counties decreased by 0.6 percent from 2007-2008. Their enrollment decline immediately after the flooding was smaller in magnitude than their declines in the two previous years and the following year.

Figure 7



## Unemployment

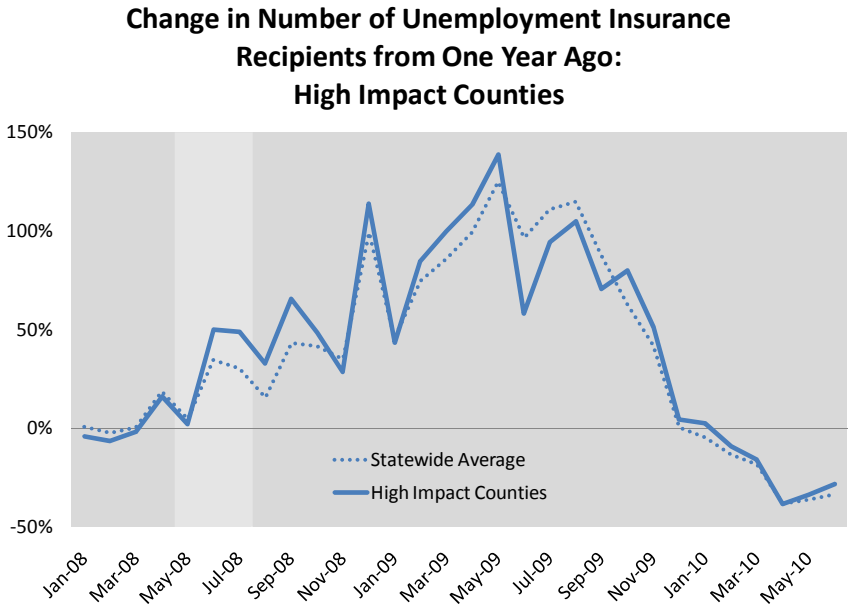
This section examines trends in two different unemployment measures to look for disaster-related effects across the three county impact groups.

### *Unemployment Insurance claims*

The weather-related disasters caused many temporary business closures and production slowdowns in the affected areas, some of which resulted in worker layoffs. A fraction of those workers would have been served by the state unemployment insurance program, which provides benefits to workers who are unemployed or working reduced hours through no fault of their own and who meet certain other eligibility requirements. Although we cannot isolate the number of workers who lost their jobs specifically because of the disasters, the change in the number of unemployment insurance recipients can provide an indirect indicator of layoffs that occurred in the impacted regions.

Figure 8 gives a good sense of the temporary pattern of UI claims increases in the high impact counties. The chart compares year-over-year changes in the high impact counties to the overall statewide trend. As would have been expected, the high impact counties experienced a noticeable increase in UI claims beginning in June 2008, with the number of recipients increasing 50 percent compared to the same month in 2007. The high impact counties continued to post rates exceeding the overall statewide average until November of 2008. From November through the present time, claim activity in the high impact counties has generally remained at or slightly above the statewide trend.

Figure 8




UI claims activity in the moderate impact counties has closely followed the statewide trend. Claims activity increased at a slower-than-average pace in the low impact counties during the summer of 2008, and the group has generally followed the state pattern.

Only the high impact counties post boosts in UI claims around the primary flood and recovery periods that stand out distinctly from the overall statewide pattern of change over the measurement periods. Readers are advised to turn to Figure 11 for a representation of the likely pattern of those claims during the summer and fall months of that year.

Figure 9

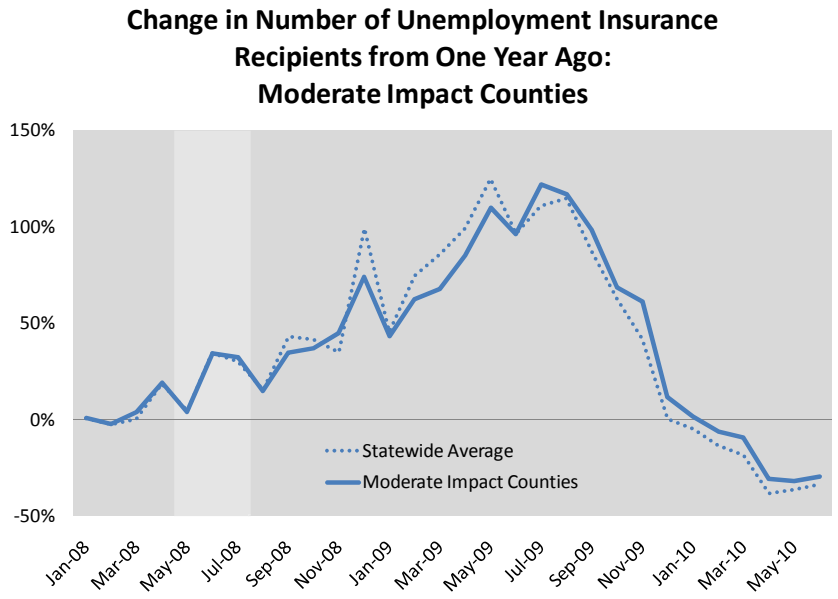
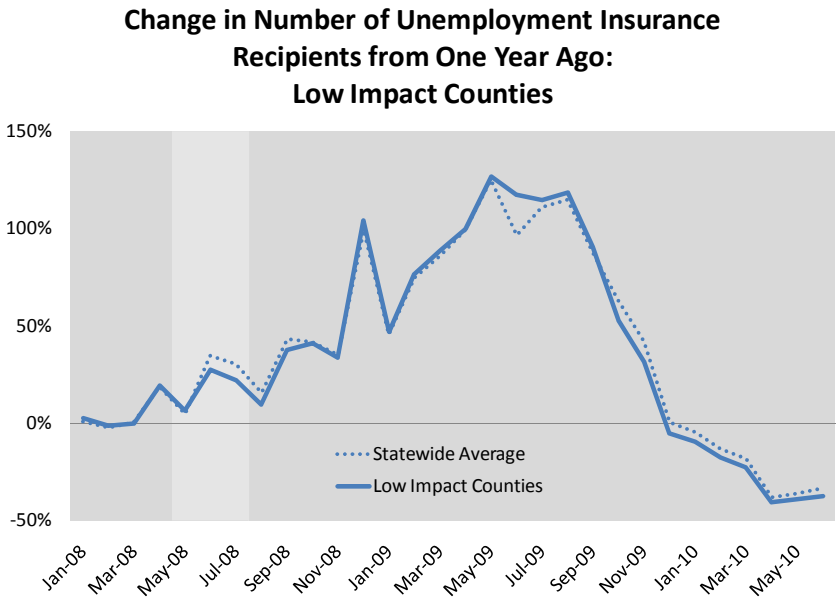



Figure 10

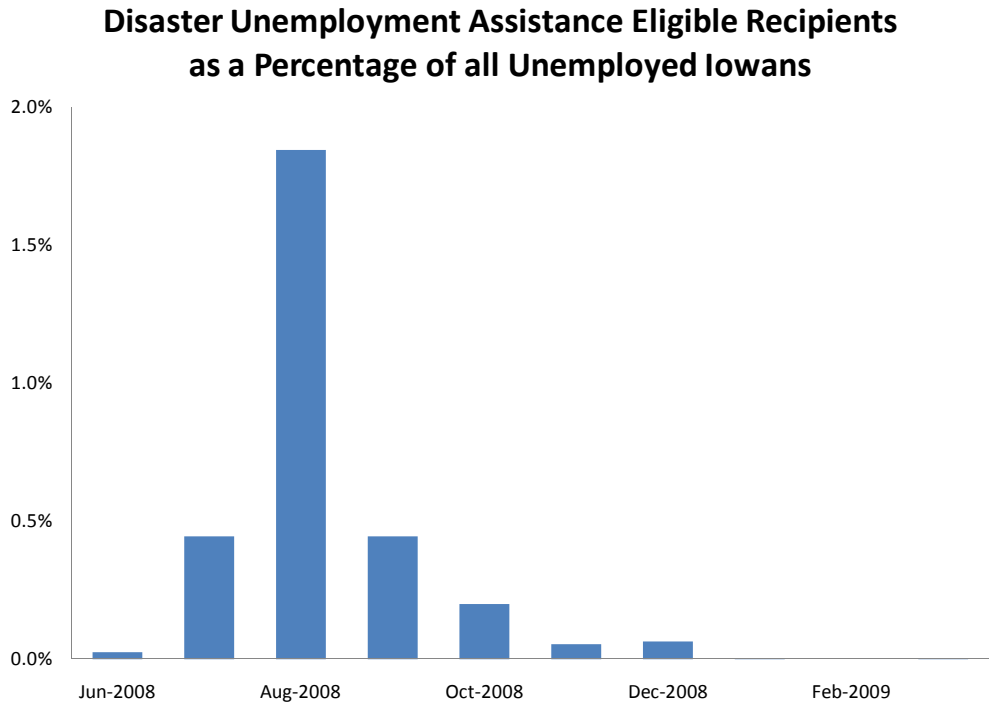


The federal government provides additional assistance under the Disaster Unemployment Assistance program (DUA) for those who would not have been categorically eligible for standard unemployment assistance, but whose jobs were disrupted or eliminated because of a recognized disaster occurrence. That program allocates assistance to, for example, self-employed persons as well as those whom by virtue of their weekly hours or the duration of their employment would not have qualified for regular unemployment assistance.

Data from the DUA program reported there were 3,025 initial applicants for disaster-related unemployment compensation statewide, and payments were made to a total of 2,109 persons for a group average of 14.5 weeks of benefits. The peak in payments was made in September 2008 to 1,330 recipients that month. The group of DUA applicants grew to represent 1.8 percent of all unemployed persons in Iowa in August 2008 before declining to less than ½ of one percentage of all Iowa unemployed in the following month before trailing off thereafter. Figure 11 displays the pattern of assistance for the state.

We can assume from these limited data that the pattern of the unemployed receiving regular unemployment assistance due to disaster related job disruptions probably followed the same sharp up-and-down dynamic, and that the overall fraction of all disaster-related unemployed persons was relatively small by the fall of 2008. This conclusion is well borne out by Figure 20 through Figure 22, as well, later in this section.

Figure 11

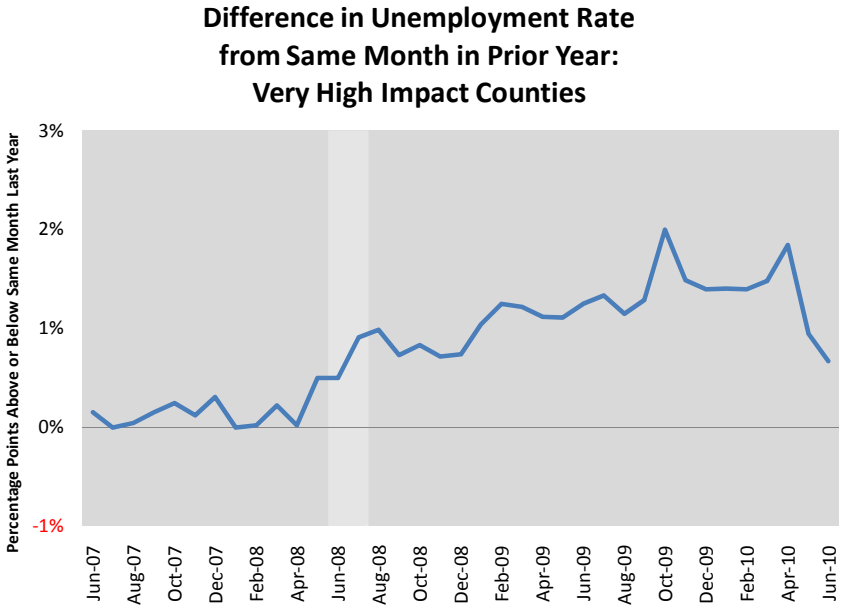


### *Unemployment rates*

Local unemployment rates provide a more expansive picture of labor market conditions than unemployment insurance claims alone. That is because unemployment is defined to include all workers who are actively seeking employment, not just workers who have been laid off from covered positions. For example, economic stress caused by the disasters may have propelled some area residents who were not previously in the labor market to seek employment to bolster their household incomes. Until their job search was successful or they became discouraged and dropped out of the labor force, these residents would count among the unemployed. Figure 12 through Figure 15 provide unemployment rate detail from the year before the devastating weather events to the present. In this series, the very high damage counties have been separated out of the high group.

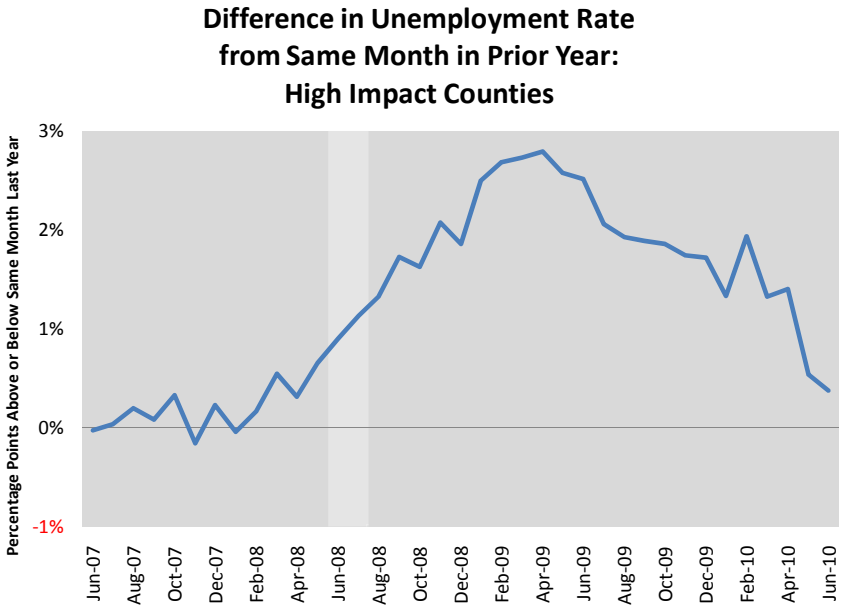
Figure 12 contains the very high impact county unemployment rate trends. These graphs measure the rate difference from the same time a year previous. For most of the year previous to the events, the unemployment rate was steady in this group, but in the spring of 2008 it began to rise. The rates increased a half of a percentage point during the period of flooding and early recovery, and the rates were a percentage point higher than the year previous for the rest of the year before climbing even more due to the recession.

Figure 12



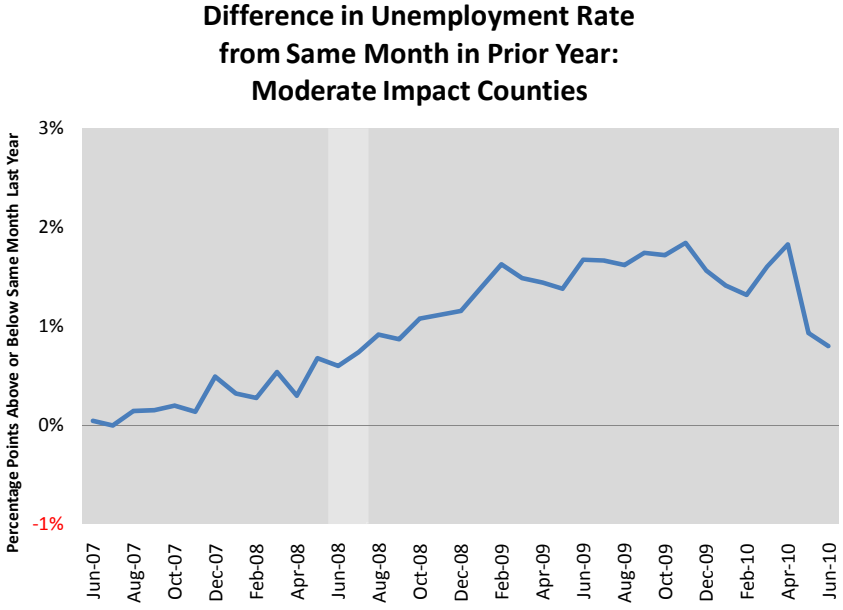

The high impact counties show too that their rates were increasing just prior to the events, but there is no visual evidence the flood events accentuated that upward trend. By the middle of April, 2009, their combined rates were nearly 3 points higher than in the year previous, and their rise appears to be primarily the result of recessionary losses unrelated to the weather events.

Figure 13



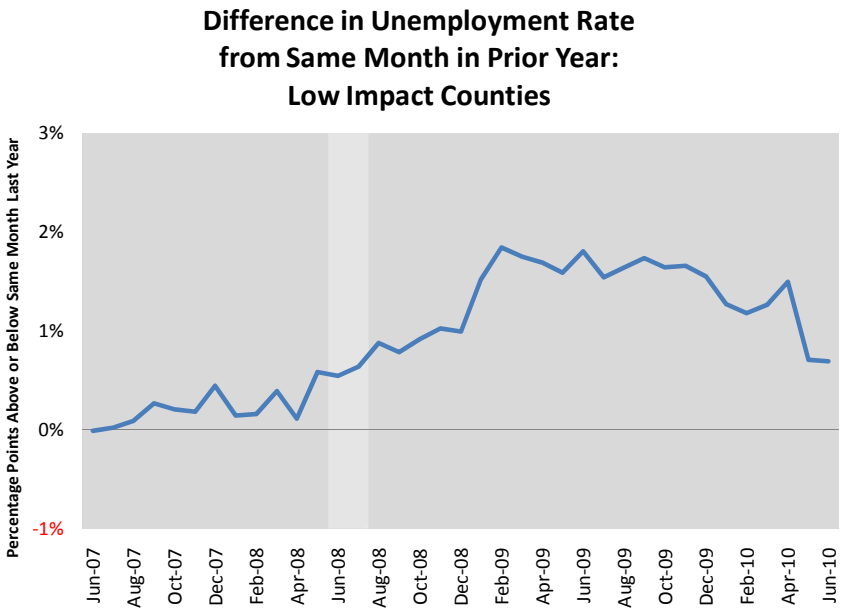

The moderate impact counties also were suffering rises in their unemployment rates compared to the year previous prior to the weather events. Again, there is no clear indication the rates were meaningfully boosted during either the flood events or the immediate period thereafter distinct from the upward trend that was already in evidence.

Figure 14



The same pattern is in evidence for the low impact counties. They, like all of the others were trending upward prior to the weather events, and there is no flood-related bump in evidence.

Figure 15




## Business activity

It is commonly assumed the weather events of the summer of 2008 had devastating consequences for business activity, most especially in areas with the highest flood impacts. Prominent examples of areas that suffered widespread damage to their business districts include Cedar Rapids, Cedar Falls, Columbus Junction, and, of course, Oakville. Large factories like Quaker Oats were inundated and production had to be idled for a time, although many of its workers re-tasked themselves into cleaning up and restoring the plant resulting in little employment disruption in that instance. In other cases, though, businesses, especially retail and service firms along with rental housing establishments, were wiped-out completely, with many not re-opening at all.

While many individual businesses suffered irrevocable losses, trade shifting resulted in other area merchants realizing sales boosts. Even in Cedar Rapids, the city with the greatest disaster related damages in the state, much of what would have been normal central city supplied retail and service goods necessarily shifted to other suppliers within the regional economy.

The shifting of business activity from one firm to another is why we try to measure net changes in region-wide business activity rather than simply tallying sales losses of individual disaster-affected firms. This section examines changes in regional business activity as measured by the number of area business establishments, total employment levels, new hires, and taxable retail sales.

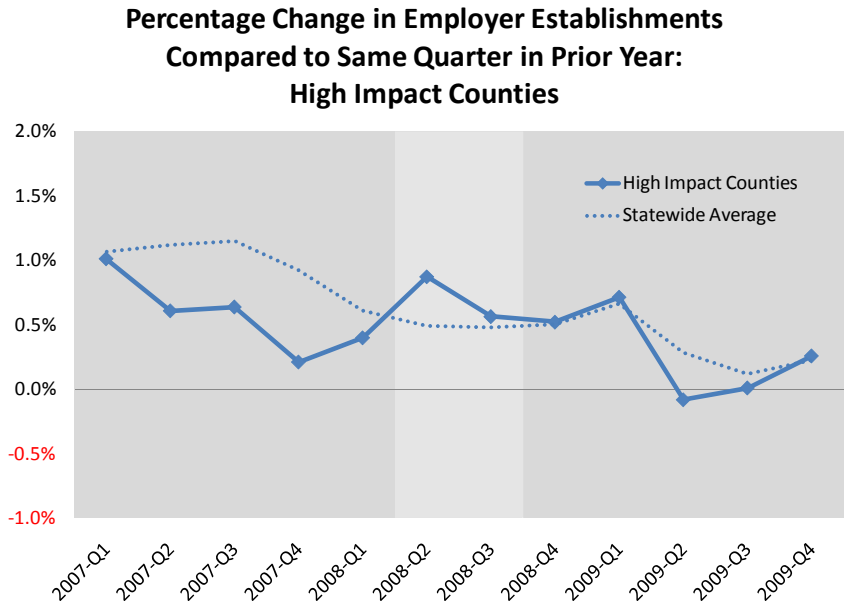
### *Nonfarm employer establishments*

While businesses failures inevitably occurred after the disasters, it is difficult to attribute changes in Iowa's business firm numbers from one period to the next to any specific cause. The number of business firms in operation ebbs and flows over time, with failures and startups occurring on a continuous basis. Establishment numbers show a strong seasonal pattern as well, typically peaking in the third and fourth quarters of each year. Comparisons over time are best made on a year-over-year basis.

Figure 16 through Figure 18 illustrate by county group the percentage change in number of establishments during each quarter of 2007 through 2009 compared to the same quarter in the previous year. The data are derived from Quarterly Census of Employment and Wages (QCEW) tabulations from Iowa Workforce Development. These data exclude small proprietorships and partnerships that have no employees (other than the principals) on payroll.

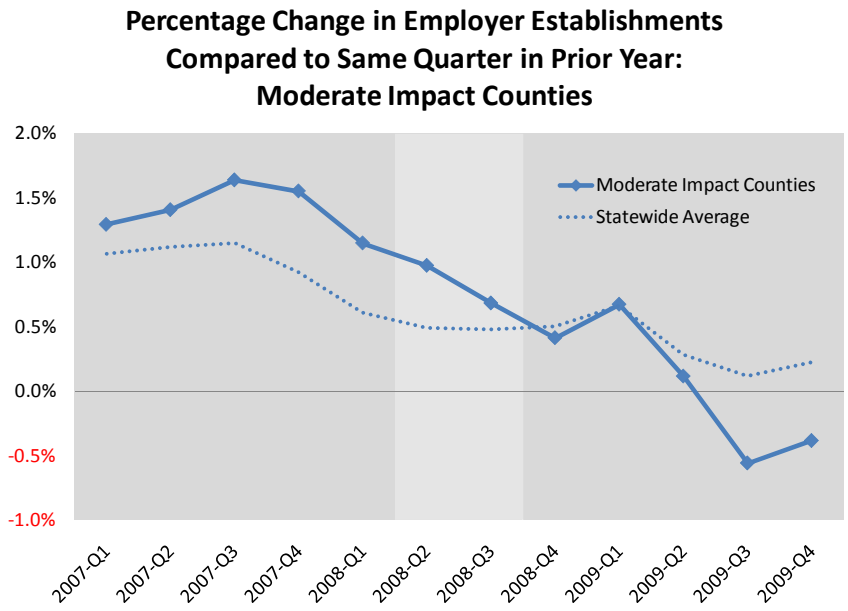
Iowa's high impact counties were posting small year-over-year gains in nonfarm establishments during the year prior to the weather events. Their rate of gain generally lagged the statewide average until the 2nd quarter of 2008. In that quarter, their establishment numbers were nearly one percent higher than the year before. The high impact counties closely tracked the state's average growth rate until the 2nd quarter of 2009, when their establishment numbers showed a very slight percentage decline from the high mark posted in the flood year.

Figure 16



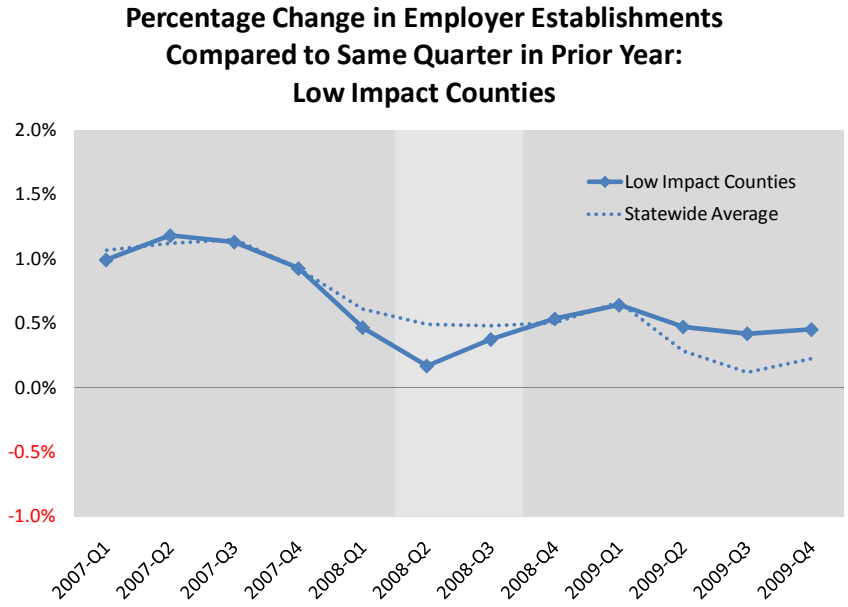

The moderate impact counties experienced comparatively strong gains during 2007 and through the disaster period. Their performance exceeded the statewide average until the fourth quarter of 2008, and they continued to post gains until the third quarter of 2009.

Figure 17




The low impact county group has closely followed the statewide trend with two exceptions: they lagged slightly during the disaster period and they out-performed the state during all of 2009.

Figure 18

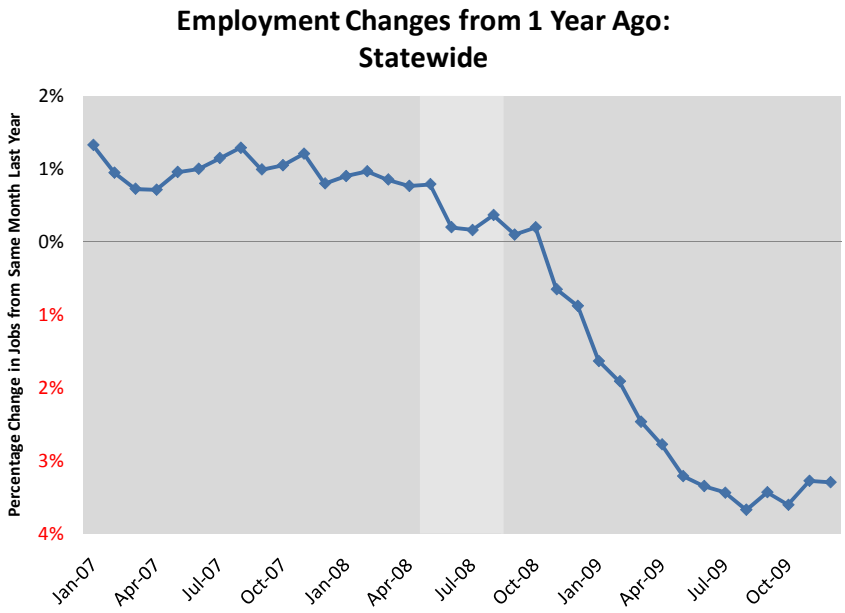


### *Nonfarm wage and salary employment*

QCEW data show that in the year preceding the weather-related disasters, the state was posting monthly nonfarm employment gains averaging about 1 percent on a year-over-year basis. The employment growth rate for June and July of 2008 dropped to 0.2 percent, then increased slightly in August. The state continued to post gains through October of 2008. From November onward, nonfarm employment began to decline as the state's economy moved into recession.

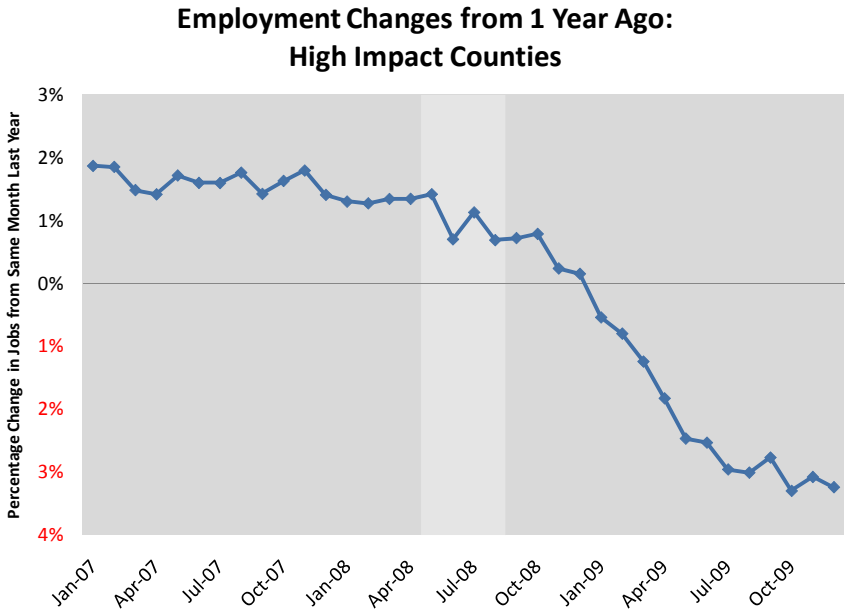
Figure 19 through Figure 22 show the change in number of nonfarm wage and salary jobs on a year-over-year basis by month for the state and the three county groups. These charts demonstrate the relative magnitude of any possible disaster-related job losses compared to the losses incurred since the recession.

Figure 19



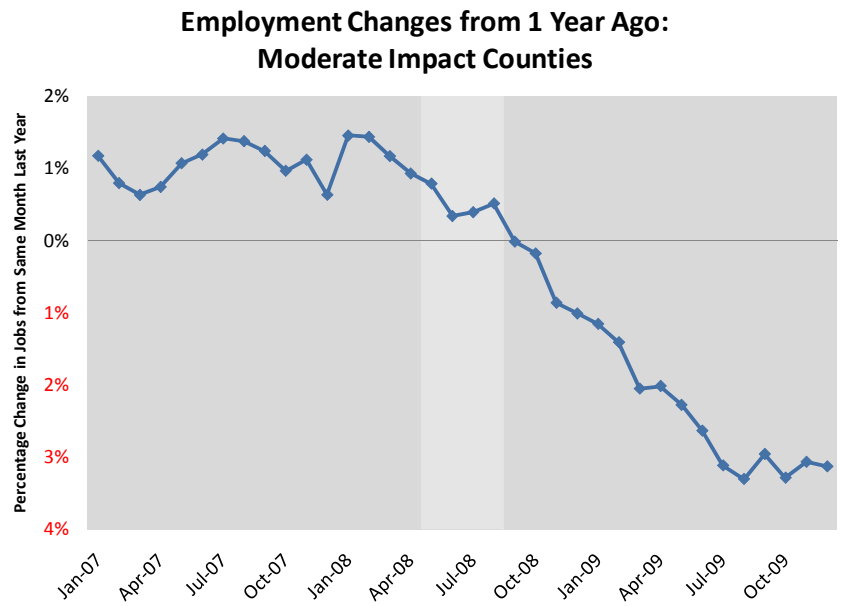

The state's high impact counties had enjoyed relatively stable employment gain rates in the months preceding the weather events averaging monthly growth of just under 2 percent over the same month a year previous. That rate declined in the second quarter of 2008 to just under 1 percent before rebounding and stabilizing through October of 2008. Thereafter, employment declines sharply, as was also evident for the state at large.

Figure 20



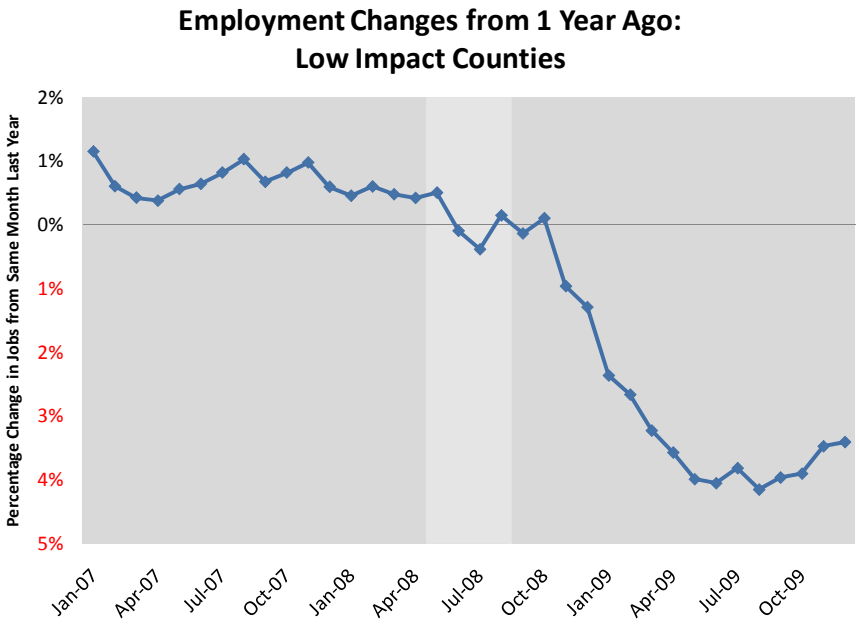

The rate of employment change in the moderate impact counties had begun to decline in the months leading up to the weather events, but still posted positive values throughout the flood impact period before tailing off sharply.

Figure 21



The rate of employment change in the low impact counties had begun to decline slightly in the months leading up to the weather events, but posted declines in July and August of 2008 before stabilizing. By November, however, growth turned sharply negative due to recessionary consequences.

Figure 22




### *New hires*

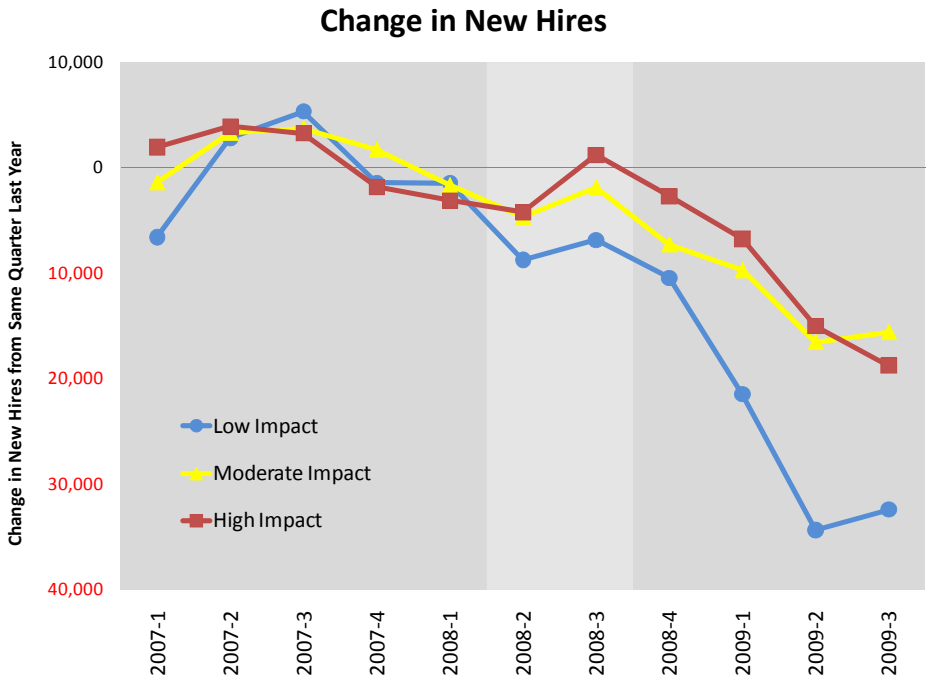
Changes in the level of hiring activity can indicate expansion or contraction in a regional economy. New hires are defined by the U.S. Bureau of Labor Statistics (BLS) as workers who were added to a firm's payroll during the current quarter who were not employed by that firm during any of the previous four quarters. The new hires measure excludes workers who were temporarily laid off and then recalled at a later date, which would have been the case for workers in firms that were temporarily impacted but were able to come back into service in the first few months after the disasters.

Figure 23 shows the year-over-year change in the number of new hires by quarter for the three county groups. During the first three quarters of 2007, the high impact counties were enjoying higher levels of new hire activity compared to 2006. For the next three quarters, their hiring activity slowed. The number of new hires in the second quarter of 2008 was about 5,000 below the level in the second quarter of 2007. New hires increased for the third quarter of 2008 and were higher than 2007 levels in the high impact counties, but dropped again in the fourth quarter of 2008 and all subsequent quarters. These latter drops are recession driven. The moderate impact counties have seen declining levels of new hires since the first quarter of 2008. The low impact counties have experienced declining levels of

new hire activity since the third quarter of 2007. For both the moderate and low impact groups, their pace of decline slowed a bit in the third quarter of 2008, but accelerated rapidly in the 4th quarter and after.

Even if the values are negative, all groups posted slight improvements in new hires performance in the third quarter of 2008 compared with the second quarter before tailing off strongly thereafter as the consequences of Iowa's recession became more pervasive.

Figure 23




## *Taxable retail sales*

Taxable retail sales are an indicator of the potential disruptions that would have occurred to households as well as firms in the aftermath of the weather events.

Figure 24 reveals that in the quarters just preceding those events the state sales gains from the year previous had sharply dropped into negative territory. Statewide retail sales did receive a noticeable boost in the 3rd quarter of 2008 due in no small part to recovery-related spending before moving sharply negative for the remaining quarters displayed. Victims were necessarily forced to repurchase personal and household goods, reconstruction and remodeling items, appliances, and replacement equipment for businesses (see also Otto, 2009).

Figure 24

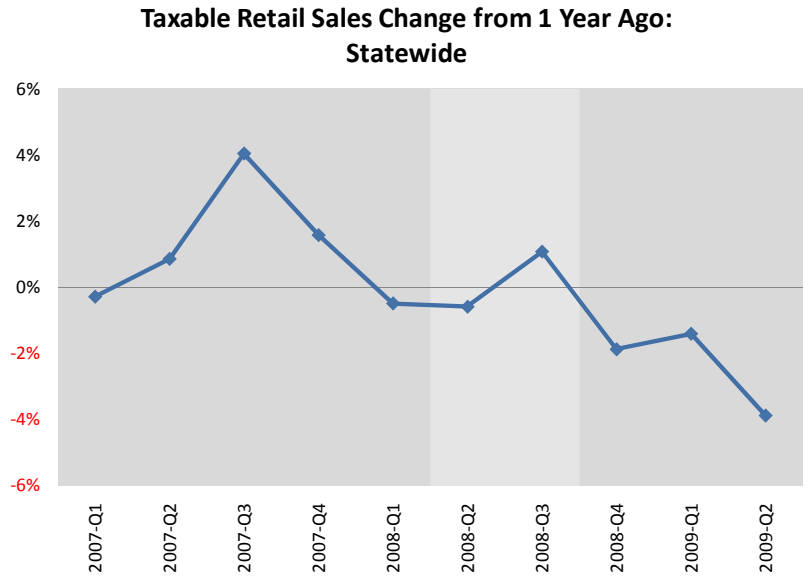
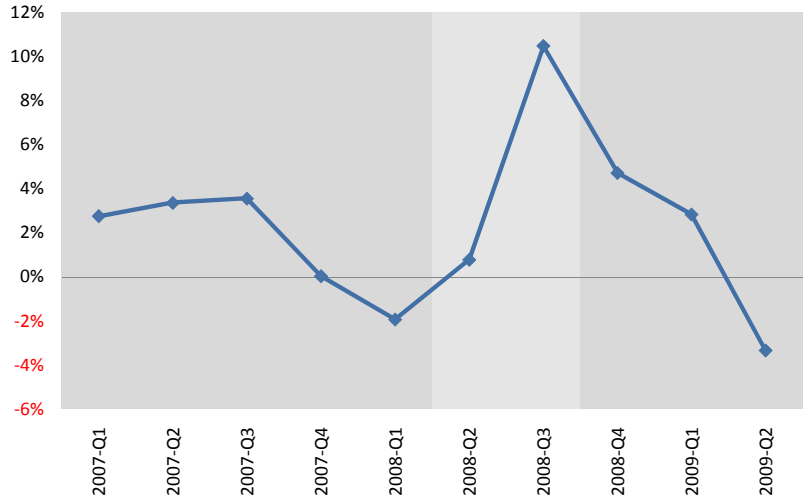



Figure 25 displays year over year retail sales changes for the high impact counties. Readers should note that the scale is higher in this graph than in the remaining retail sales examples or in the previous state of Iowa example. For that group, retail trade was trending into a decline prior to the floods. Sales posted strong increases, however, by the 3rd quarter of 2008 of 11 percent more than the same time a year previous. Those retail sales tailed off but remained still in positive territory for two more quarters.

Figure 25



Sales in the moderate impact counties were in decline when compared to the year previous. Spending just eked positive by the 3rd quarter of 2008 before turning sharply negative for the remaining periods. The low impact counties were showing slight negative performance prior to the flood. Like all of the other groups, sales turned positive in the quarter three of 2008, but turned sharply negative due to the recession.

Figure 26

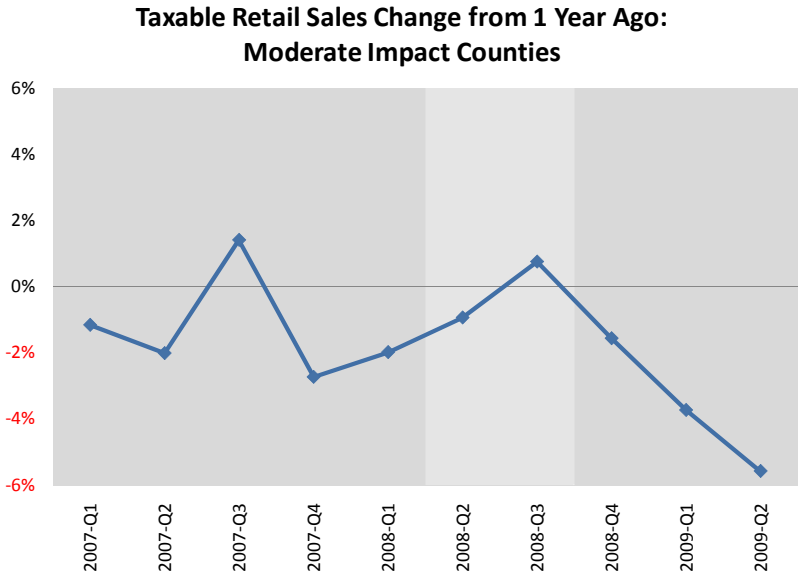
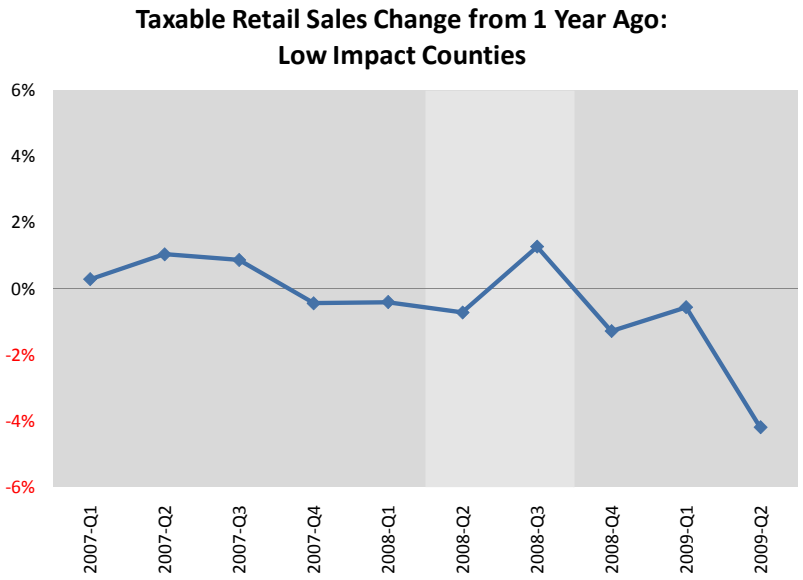



Figure 27



## Section 2 – Sets of regional private sector economic impact indices

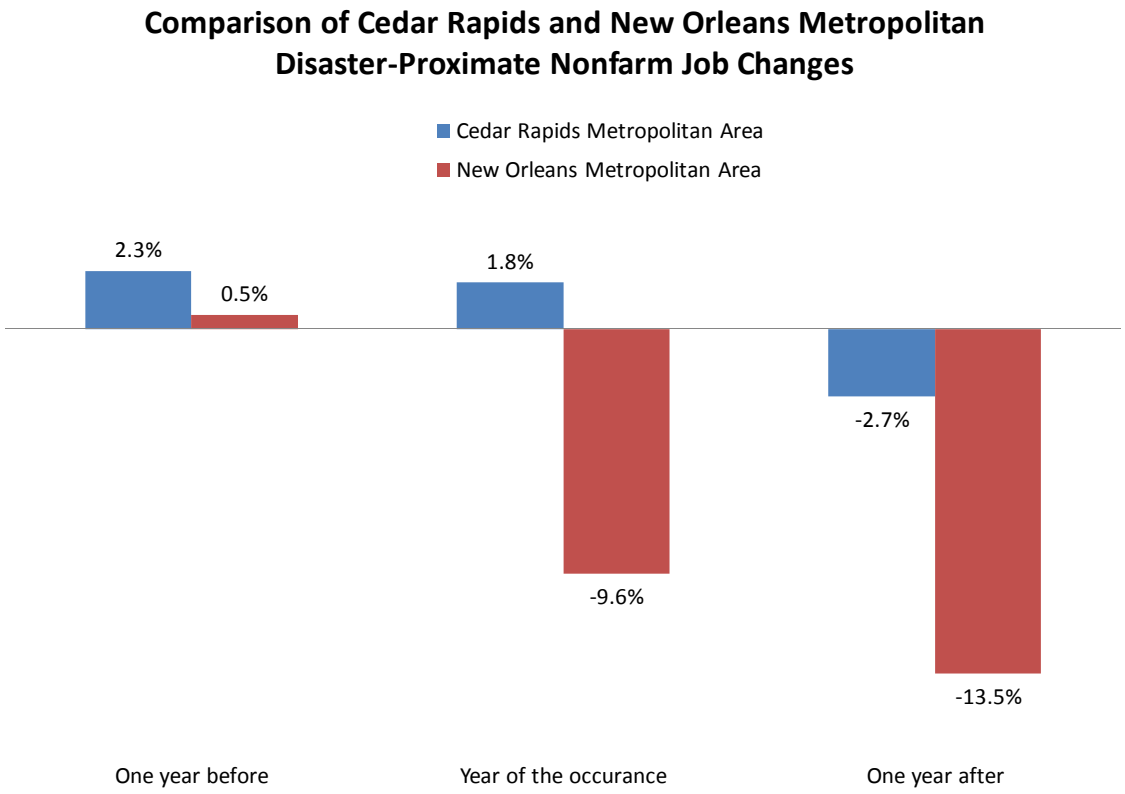
A definitive economic impact summary of the Iowa disasters of 2008 would require, *a priori*, a declaration of the annualized value of household consumption, business purchases, and statewide productivity changes caused by those events. The preceding analysis of indirect economic indicators demonstrates that cumulative economic consequences of the weather-related occurrences are nearly impossible to quantify on a statewide basis. Even in areas of highly concentrated loss, the disasters do not appear to have greatly or permanently reduced overall, region-wide productivity.

A closer examination of the Cedar Rapids economy illustrates the difficulty in isolating regional productivity changes associated with Iowa's weather-related disasters. Flooding in Cedar Rapids caused widespread destruction of its central city housing stock and a sharp decline in affordable rentals, tragic devastation of a significant portion of the downtown commercial and government district, and temporary reductions in some manufacturing activity. At the time, the devastation in Cedar Rapids even drew some comparisons to the city of New Orleans in the wake of Hurricane Katrina (Lyderson, 2008; Saulny and Davey, 2008). Those comparisons notwithstanding, Cedar Rapids did not experience the types of measurable productivity or population losses suffered by New Orleans in the aftermath of Hurricane Katrina.

The before and after effects of Hurricane Katrina could be clearly distinguished across a broad range of indicators, allowing for an estimation of the annual economic impacts of those differences. For instance, the city of New Orleans lost more than half of its residents in the year following the hurricane. Recent estimates for Cedar Rapids show no measurable population loss in the year after it flooded. Where New Orleans realized an annual decline in employment of 9.6 percent in the year of the disaster, even with the massive clean-up and restoration funding that immediately followed, Cedar Rapids posted an overall employment gain in the flood year over the year previous (see Figure 28). New Orleans continued to post steeper declines in the year after, whereas Cedar Rapids did contract, but did so very much in alignment with the rest of the state as the overall recession set in.

Clarity of consequences, starkly evident in the New Orleans example, is not evident from the 2008 Iowa disasters, as was demonstrated quite conclusively in the first section of this report, both for high impact areas as well as the state of Iowa as a whole.

Figure 28




As no *prima facie* data case can be made as to the magnitude or duration of the net losses in either regional or statewide nonfarm productivity due to the floods in 2008, there can be no reliable economic impact summary made of the consequences. Accordingly, the potential localized and temporary losses on an indexed basis are demonstrated in this section as a substitute for such an evaluation. These indices can serve as multiplier tables for city planners and disaster officials to estimate the value of losses if, in fact, the losses ultimately result in overall reductions in regional economic productivity. Similar indices have been compiled in the forms of technical assistance by the authors for state planners and local disaster officials to help them understand the value of, for example, reconstruction activity or employment disruptions in food processing firms. The following impact indices were re-constructed using an input output model of the combined Cedar Rapids and Iowa City metropolitan region using 2008 data. Before listing the results, a brief primer on interpreting input-output model results is in order, as input-output models are used to compile economic consequences summaries.

## Input-output terminology and interpretation

Input-output (I-O) models are used to evaluate the possible region wide economic value of production changes or some shock to an economic system. I-O models are completely transparent systems composed significantly of actual government-collected data for a regional economy, to include the total number of jobs in each industry, labor incomes, and the number of proprietors. These models also estimate purchases that industries make from one another within the study economy, based on national

surveys of industrial transactions. Through a series of mathematical manipulations the modeling process compiles the activity of the industry in question, its relationship to supplying firms, and other important transactions that occur in an economy when industrial production or household consumption changes.

There are three key variables that are often reported from impact modeling systems along with three economic effects or values dimensions. *Industrial output* is the sales value of all commodities produced during a calendar year as a result of what we are measuring. *Labor income* is composed of wages and salaries and returns to proprietors. The last indicator reported is the *jobs* summary. There are more jobs in the economy than employed persons as many people have more than one job. Jobs are not to be confused as representing full-time employment. However, the job values that are declared in an impact model consider those job amounts on an annualized basis.

The three reporting dimensions are the direct values, the indirect values, and the induced values. *Direct values* are those that relate specifically to the industrial activities that we are studying. The *indirect values* represent the industrial activity that is stimulated in the region when the direct firms buy all manner of production inputs from regional suppliers. *Induced values* accumulate when workers and business owners convert their labor incomes into household spending. When these three dimensions are summed, they constitute an unduplicated estimate of the total value of the economic activity to the region under study.

There are a few other preliminary considerations to convey. First, input-output models are annualized representations of a region's economy, and the results are therefore expressed in per-year increments. As an easy example, assume an elected official whose term is to last four years. We do not count that as four jobs when we describe the size of our economy, we count that as one job over four years. The same logic applies to economic impact studies.

Second, I-O models describe the value or the total economic effect of an industry or some change scenario on a regional economy. An economic impact occurs, however, only when there is a discernible and measurable change in total regional activity. If an economy has a wooden rocking horse factory, it can safety be assumed it is producing primarily for export and that closing that factory will yield a drop in export sales regionally; hence, a decline in regional productivity. If an economy on the other hand is losing a dining establishment because the establishment cannot make a profit, while the loss of the establishment can be measured, there is not necessarily a change in regional productivity as patrons will seek alternative dining establishments that already exist in the area – sales will merely shift, not disappear. When modelers use the phrase "economic impact" they should be referring to the former situation. Stated differently, unless incontrovertible changes in regional productivity can be determined, the phrase "economic impact" should be used very cautiously.

I-O models are used to tell us how industries inter-relate with one another at the present time. That mathematical intelligence is used to make short-term projections. There are many characteristics of I-O models that suggest interpretive caution when utilizing them:

- The prices in I-O models are fixed, as also are supply and demand relationships
- There are no substitutes (like switching from coal to natural gas) and the supply of all inputs is infinite
- All resources are fully employed meaning the model assumes there is no slack in the economy in terms of labor or capital utilization
- The models describe average changes or average values which in fact may be much different than marginal changes in a mature economy
- The models do not capture any scale economies

Last, unless specifically modeled, I-O systems do not factor in regional offsets to the initial event. For example, when a plant closes, workers are eligible for unemployment assistance, federal and state funded education and retraining aid, and other categories of income, food and nutrition, energy, or housing assistance. The modeled regional impacts of an industrial change are significantly at odds with reality when government safety net programs have muted the economic consequences in the first year of the event. The model conclusions must be tempered by these offsets for an impact summary to accurately reflect regional impacts during the transition period.

## A reduction in retail trade index

We know from Section 1 that areas with the highest flood related impacts actually had temporary net increases in employment and retail trade. Despite this general finding, the first index looks at the value of a reduction in retail spending in an area. There are eleven retail categories in the I-O model, and they were all "shocked" by their proportional composition of the regional retail trade total to a combined amount that represents a loss of $1 million in sales at the cash register.[3]

Table 2 provides the summary impact values per $1 million in reduced (or for that matter increased) retail sales. As, in this case, both the Cedar Rapids and Iowa City metropolitan regions serve as major trade centers a small portion of their combined retail sales can be considered as export oriented in that they serve the needs of persons external to the region. Per $1 million in lost sales at the cash register for the weighted average of all retail activity in that combined region, 5.4 jobs making $131,601 in labor incomes would be reduced.[4] As those area businesses would require $62,005 fewer regionally supplied inputs, the supplying sectors would contract by 5/10$^{th}$ of a job with a loss of $19,641 in labor income. When the direct and the indirect workers converted their paychecks into household consumption, they would have induced $95,434 in area output, which required 9/10$^{th}$ of a job earning $28,667 in labor income. Combined, per $1 million in reduced retail activity, the region would see a reduction in 6.8 jobs and nearly $180,000 in labor income.

[3] The direct retail sales reduction in this example represents the price paid by consumers. In translating this sales reduction to an economic impact value, the I-O system does not count the underlying cost of goods sold as part of the retail sector's output as those values are already accounted in the sector in which they were produced.

[4] Readers are reminded that both the job and the labor income figures consider sole proprietors in their estimates, an especially important consideration for many retail categories.

Table 2

**Index of a Permanent Reduction of $1 Million in Annual Regional Retail Sales**

| | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Output* $ | 1,000,000 | 62,005 | 95,434 | 1,157,439 |
| Labor Income $ | 131,601 | 19,641 | 28,667 | 179,910 |
| Jobs | 5.4 | 0.5 | 0.9 | 6.8 |

**The direct retail output value represents the sales amount at the cash register. IO accounting margins all costs of goods sold yielding output values reflecting only value added and overhead costs. That amount for this table is $306,245.*

Remembering that these data are expressed on an annual basis, this table can be used in several ways. It can be used to simply describe the value of losses in a circumscribed area of, for example, Cedar Rapids or Coralville. Suppose city planners determined that 400 retail jobs were lost in the central business district of Cedar Rapids for one full year as a result of the devastation. Planners would simply divide those 400 jobs by the direct job value of 5.4 to obtain a scaling factor of 74.1 (400 / 5.4 = 74.1). This scaling factor could be multiplied by every value in Table 2 to arrive at an area specific impact summary. It would not be appropriate, however, to use that value as a final summary without first determining the magnitude of actual retail trade changes in the greater region. As trade will have shifted, the actual retail consequences may very well have been significantly absorbed by existing business capacity in the greater metropolitan areas.

If, alternatively, there were 400 fewer jobs for an average of 6 months, then the previous values would be divided by 2.0 to get the annual worth of that conclusion. If there were, alternatively, 400 jobs lost for an average of 1.5 years, the responsible planner would use the first ratio of 74.1 to inflate the table to represent Year 1 conclusions, and that responsible planner would divide those values by 2.0 to represent Year 2 of those data. It would be inappropriate to add the two values together as I-O values are expressed on an annual basis only.

In addition, as this modeled region is part of the high impact area, the very short term boost in retail sales that were in evidence within this region could be modeled using the same impact table to estimate the temporary value of increased spending by firms and households.

Finally, as there may have been sales shifting from, say the city of Cedar Rapids to bordering cities, the values in Table 2 can be used to describe the intra-regional losses and gains even if region-wide changes are nonexistent or negligible. In those cases, however, one would simply report the direct values to indicate the primary value of the shifts.

## A reduction in the dining and accommodation service activity index

Dining, lodging, and other personal accommodation services are prominent in the central city economies of this region, serving local and non-local patrons alike. This example illustrates a change in dining and accommodation industry sales in the model territory. Values for these regional service industries, like the retail sector, are indexed per $1 million in sales at the cash register.[5]

Table 3 provides the findings. Per $1 million in dining and accommodation sales, nearly 20 jobs making $314,072 in labor incomes were required. Those firms procured $294,518 in regionally supplied inputs, which needed the equivalent of 2.0 jobs making $79,226. When workers spent their pay they induced $247,495 in additional output, which required 2.3 jobs making, combined, $74,357. In all, per $1 million in reduced sales (or output), the losses would translate into a reduction of 24.2 jobs making $467,655 in labor incomes.

Table 3

**Index of a Permanent Reduction $1 Million in Annual Regional Dining and Accommodation Sales**

| | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Output $ | 1,000,000 | 294,518 | 247,495 | 1,542,013 |
| Labor Income $ | 314,072 | 79,226 | 74,357 | 467,655 |
| Jobs | 19.9 | 2.0 | 2.3 | 24.2 |

Again, more research would be needed to determine the degree to which there was an actual net reduction in sales in those sectors region-wide to apply this table to regional losses. Nonetheless, the table can give a sense of the worth of the loss to a particular region even though losses in the broader region might not be evident. If, as in the previous example, it were determined there were 400 service sector job losses in these industries for a period of a year, a local planner could divide those 400 jobs by the direct job value of 19.9 for a scaling factor of 20.1. That factor can then be multiplied by all of the values in Table 3 to arrive at a summary of the annual value of that economic disruption. The direct values can also be used, as indicated before, to estimate and describe the shifting that may have occurred in the regional economy in response to the weather events and recovery.

## A reduction in rental housing supply

Widespread damage and destruction of rental housing occurred during the weather events. The median rent paid within the combined Cedar Rapids and Iowa City metropolitan areas was about $675 in 2008. One million dollars in payments to the real estate sector would have been, if annualized, enough to cover about 123 median-valued rental units.

[5] Unlike the retail sector, I-O models count service sector cash register sales analogously to industrial output, so the interpretation of the findings is more straightforward and in line with conventional interpretations of the results.

Table 4 displays the economic impact index table that would be used were there a permanent reduction of $1 million in rental housing within the region. Each million dollars in payments to the regional real estate sector would be expected to support 9.3 jobs and almost $170,000 in labor incomes. That sector would have required $138,833 in regionally supplied inputs, necessitating 1.2 jobs in the supplying sectors earning $42,853. When the direct and indirect workers converted their paychecks into household consumption, they would stimulate enough sales to support 1.3 more jobs and $41,955 in labor incomes. Each $1 million in rents therefore support 11.8 jobs and $254,365 in regional labor incomes.

Table 4

**Index of a Permanent Reduction in Regional Housing Rentals**

| | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Output* $ | 1,000,000 | 138,833 | 140,027 | 1,278,860 |
| Labor Income $ | 169,557 | 42,853 | 41,955 | 254,365 |
| Jobs | 9.3 | 1.2 | 1.3 | 11.8 |

Again, this table can be used to approximate permanent reductions in housing rental sales in a community by using either a multiple of the $1 million in rents, if that value is known, or by converting the table using lost housing rental industry employment. If it were determined, for example, that damaged and destroyed rental receipts were down $4.5 million for the year following the flood in one of the affected communities, a city planner could multiply every value in Table 4 by 4.5. If instead that planner knew that there was a reduction in rental-housing employment of 100 in that community, the table can be used by dividing 100 by 9.3 direct jobs (100 / 9.3 = 10.75). The table values could be multiplied by 10.75 to arrive at an estimate of the localized impact of that loss.

## A reduction in value added agricultural and food processing

The flood of 2008 inundated food processing industries that are an important component of the Cedar Rapids and Iowa City regional food and agri-processing industrial cluster. Unlike the retail and service examples previously described, these industries produce significantly for export production.[6] Any permanent disruptions in their productivity can be assumed to yield consequential negative local economic impacts – when they are not producing, by definition, regional productivity contracts.

Several companies were flooded. Some shut down. Others kept their workers on payroll and tasked them with cleaning and repairing their plant. Some were only interrupted for a short period, some for a longer period. After coming back on line, some plants may have utilized excess capacity to make up for lost production while others may have conducted business as usual closing out the year with reduced overall output. The degree to which these exporting firms, individually or in the aggregate, altered their production, either temporarily or permanently, is not known.

[6] Readers are reminded that “exports” means sales outside of the study region. They can be to the remainder of the state, the remainder of the nation, or to the rest of the world.

The impact example for this sector differs from the previous two examples by assuming a more temporary disruption to regional productivity. Table 5 represents total economic value of a month's worth of value added grain processing in the region's cereal, wet corn milling, and soybean processing sectors combined. A month's worth of production in these industries would have required the annualized value of 232 workers making $21.98 million in labor incomes. These industries purchased, each month, $69.22 million in inputs requiring 391 jobs making $19.12 million labor income to supply. Those direct and indirect workers induced $25.8 million in induced activity, requiring 244 further workers making $7.76 million in labor incomes. The total monthly worth of this production yielded the equivalent of 867 jobs and $48.86 million in labor incomes.

Table 5

**A Month's Worth of Value Added Grain Processing**

| | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Output $ | 325,450,008 | 69,219,080 | 25,828,950 | 420,498,021 |
| Labor Income $ | 21,984,578 | 19,117,932 | 7,760,677 | 48,863,189 |
| Jobs | 232 | 391 | 244 | 867 |

As it stands, this table can provide index values for the region. If a community planner were to assume that ultimately 25 percent of this sector's production was completely constrained for two months, then all of the values in Table 5 would be multiplied times 2.0 (two months) and by .25 (a quarter of the production), yielding final, annualized job loss values in this hypothetical of 434 with an estimated $24.4 million in combined lost labor incomes.

## Property loss consequences for local government tax collections

There is of yet no complete estimate of statewide net taxable valuation adjustments that are directly attributable to flooding in2008. The city assessor's office of Cedar Rapids, however, compiled a comprehensive evaluation of the commercial, residential, and industrial assessed value impacts in the immediate aftermath of the events. Average total valuation losses for flood damaged residences, they estimated, were $35,250, and the averages losses per damaged commercial establishment were $116,400. Using those values as typical of residential and commercial losses, the following table was compiled to estimate the property tax reductions that those losses would equal were local governments otherwise unable to make up those revenues through rate increases applied to the remaining tax base.

Table 6 provides per 100 damaged residences the potential property tax losses to all levying authorities by levy rates ranging from $32.5 (per $1,000 of taxable valuation) to $40.0. The same table gives the range of potential losses per 10 commercial business establishments. While these are metropolitan area damage estimates, it should be noted that flood-plain area housing and commercial establishments in general tend to have lower average values than properties in non flood prone areas. The range of

rates allows this simple table to be applied in both rural and metropolitan settings in the impacted region.

Table 6

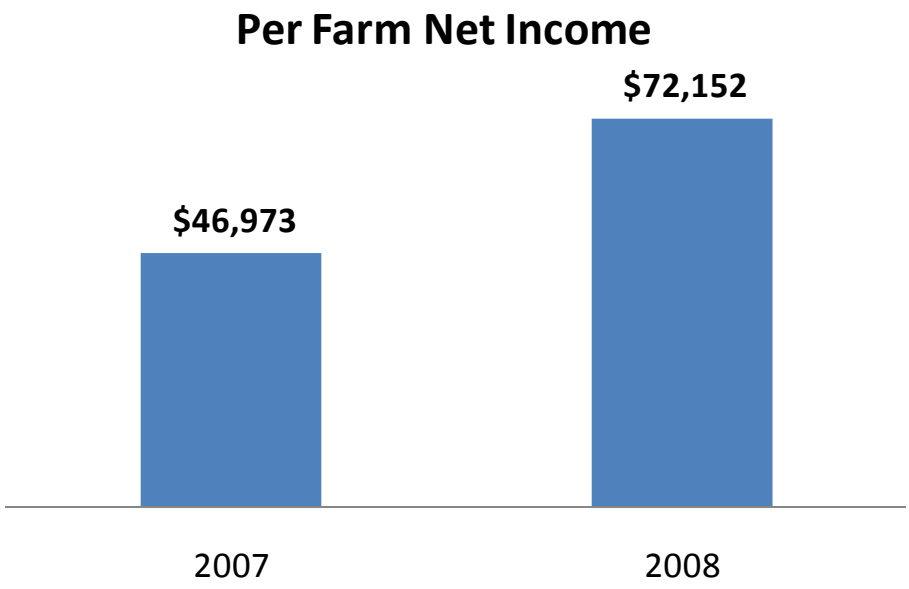
**Property Tax Losses Considering Different Consolidated Property Tax Rates Per $1,000 of Taxable Valuation**

| Taxable Value of 100 Residential Property Losses: | **32.5** | **35.0** | **37.5** | **40.0** |
|---|---|---|---|---|
| $ 1,656,808 | $ 53,846 | $ 57,988 | $ 62,130 | $ 66,272 |
| Taxable Value of 10 Commercial Establishment Property Losses: | | | | |
| $ 1,164,220 | $ 37,837 | $ 40,748 | $ 43,658 | $ 46,569 |

## Section 3 – An exploration of the potential agricultural impacts of the weather-related agricultural production losses

The initial expectation from the long wet spring of 2008 and the subsequent flooding that occurred in June of that year was that agricultural crops would be damaged severely and Iowa farmers would suffer substantial losses. 2008 ended up being a very good year for Iowa crop farmers, the devastating weather notwithstanding. Figure 29 compares net per farm income in 2007 and 2008. Even with the weather-related disruptions, Iowa farmers' average incomes rose by 54 percent, according to the Bureau of Economic Analysis. While a good fraction of those gains were attributable to high grain prices early in that year, that year also produced a strong corn crop. Yields per acre were comparable to the year before and second highest in that decade. Soybean yields per acre were reduced, however, by about 10 percent due to late plantings. In addition, the boosted per-farm incomes were strong enough to mask what was a very disappointing year for Iowa livestock producers whose margins suffered strongly due to the high feed costs that otherwise worked to the benefit of crop farmers.

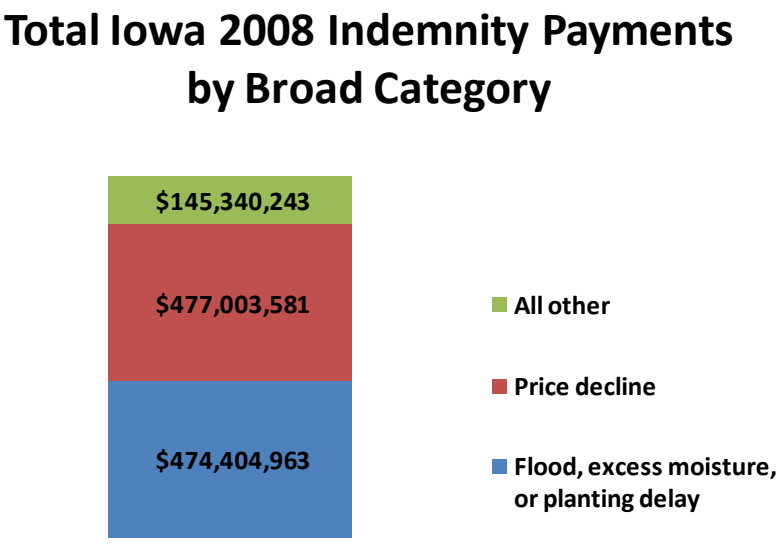
Figure 29




Now that sufficient time has passed for a more complete accounting of all of the events of that period, we can estimate the weather-related crop damage distinct from all other crop supports. There are two sources of major payments to farmers. Farmers participating in USDA crop programs have a very high likelihood of also having crop insurance. As crops were insured against losses, those payments represent a reasonable estimate of a good fraction of the losses borne by a good fraction of Iowa's farmers. In addition, as insurance does not cover all losses, Iowa grain farmers in particular enjoy robust federal disaster support under the Supplemental Revenue Assistance Program (SURE).

Figure 30 informs us that of the nearly $1.1 billion in total insurance-related payments to Iowa farmers in 2008, less than half, $474.4 million was due to flooding, excess moisture, or planting delay. From an analysis of all categories of payments, it was determined that those values represented the preponderance of outlays that were flood related, and that the remainder would be considered to be non-flood related occurrences. There were some animal losses attributed to the weather events, but it was not possible to sort out which of the payments was weather related and which were related to other factors. As those amounts were comparatively small, they were ignored in the foregoing assessments.

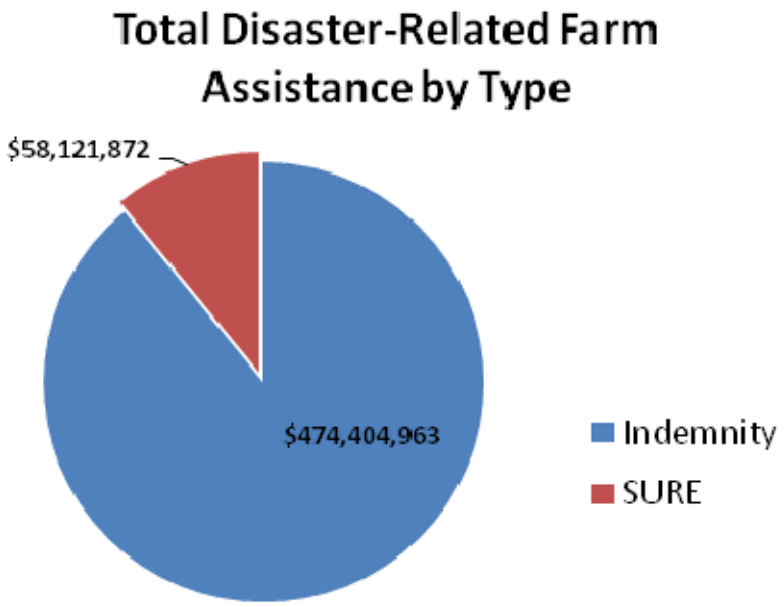
Figure 30




While over $135 million in SURE payments were made to Iowa famers for 2008, as with the indemnity summaries, not all of those payments were disaster related. Figure 31 provides a reasonable estimate of the size of all disaster-related payments by insurers and by the USDA to Iowa's farmers. The combined programs amounted to $532.5 million, a value significantly less than originally feared.

While it is likely true that not all losses to all farmers were completely compensated, it is also equally true that Iowa farmers were made substantially more whole from insurance and federal aid than any other group of private sector victims of the devastating floods. Still, we can estimate the value of this assistance, for had it not materialized, it would have had a discernible economic impact in Iowa.

Figure 31




Although widespread inundation interfered with the optimal corn planting period, many farmers were still able to plant or replant their fields in soybeans. Comparing crop acres in 2007 with 2008, it is reasonable to assume that 200,000 acres of what would have been corn acres were not planted and that 32,000 acres of soybeans did not make it into the ground.[7] That represented the equivalent of 1.4 percent of all corn acres and .3 percent of soybean acres, given plantings the year previous.

Table 7 provides an estimate of the potential economic impacts of not getting those corn and soybean acres planted. To do so would have required the equivalent of 422 farm level jobs. That activity would have required $30.7 million in purchased inputs, which would have supported another 198 jobs in the supplying sectors. Finally, that activity would have supported 132 induced jobs for a total job value of those acres of 752.

Table 7

**The Potential Economic Impacts of Corn and Soybean Acres Not Planted**

| | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Output | 109,016,002 | 30,699,685 | 13,839,296 | 153,554,983 |
| Labor Income | 10,684,569 | 7,549,498 | 4,121,754 | 22,355,821 |
| Jobs | 422 | 198 | 132 | 752 |

[7] Estimates provided by Chad Hart, Assistant Professor of Economics, Iowa State University.

While indemnity and SURE payments assist the farmer, they do nothing to assist the lost sales that would accumulate to suppliers because those acres were not planted. However, because that crop year required many farmers to replant, that actually stimulated more seed, energy, and chemical indirect inputs than would normally have been the case, yielding more sales by ag-related suppliers. It is likely that replanting activities more than offset losses to suppliers due to no planting and actually provided a boost to rural economies in those sectors. This is a perverse but beneficial consequence of that period.

Table 8 evaluates potential ag losses in a different manner. It takes the full value of indemnity payments, $532.9 million, and measures what would have been the short-term economic losses to the state had that full value represented a complete loss in crop productivity because an amount of land required to generate that value in sales sat idle for one year.

Had this make-believe scenario played out, and of course it didn't because of the indemnity and government assistance offsets, the value of lost productivity would have been equivalent to 2,042 direct farm level jobs making, combined in the production of corn and soybeans, $52.3 million. Those farmers would have required $150.2 million less in inputs, which would otherwise have required 970 jobs to supply making $36.94 million in labor incomes. Finally, lost earnings by ag workers and workers in supplying firms would not have been converted into household consumption, which otherwise would have induced $67.7 million in output requiring 646 jobs and $20.2 million in labor incomes. In all, the value of indemnity and SURE payments in this scenario was the equivalent of supporting 3,658 Iowa jobs and $109.4 million in labor incomes.

Table 8

**The Potential Economic Impacts of Losses Offset by Indemnity and SURE Payments**

| | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Output | 532,903,917 | 150,185,363 | 67,711,104 | 750,800,422 |
| Labor Income | 52,261,632 | 36,937,454 | 20,166,187 | 109,365,273 |
| Jobs | 2,042 | 970 | 646 | 3,658 |

It is not correct to assume that the combined insurance and disaster payments saved the equivalent of 3,658 jobs in Iowa. Those payments were made to cover complete losses, partial losses, and an inability to plant (which is subsumed in Table 7, and would be considered a subset of Table 8). Field work would have been completed for complete and partial loss situations, meaning all indirect activity and a substantial portion of induced activity would have occurred, and indeed did occur. Table 8 assumes that all payments represented a complete inability to plant.

## Section 4 – The short-term economic impacts of publicly funded disaster recovery

The recovery efforts in Iowa were massive and wide spread, though the vast majority of spending has been concentrated in six counties. RIO data provide high detail as to the sources, amounts, and in many instances the spatial allocation of those resources. Summaries of the appropriated amount of that assistance and its sources are displayed in Table 9. Cumulatively, $3.35 billion has been appropriated by state and federal sources in support of disaster recovery as of the first week of July, 2010.

Table 9

**All Disaster Related Appropriated Resources, July 1 2010**

| | |
|---|---|
| Federal Emergency Management Agency | 1,090,950,142 |
| Community Development Block Grant | 540,443,861 |
| Iowa Finance Authority | 502,746,530 |
| USDA | 316,562,179 |
| U.S. Small Business Administration | 272,436,500 |
| I-Jobs Bonding | 167,612,924 |
| Regents Bonding | 100,000,000 |
| Army Corps of Engineers | 92,694,548 |
| Economic Development Administration | 54,977,656 |
| EEF State Appropriation | 53,693,532 |
| State Jumpstart | 34,890,407 |
| U.S. DOT | 34,105,377 |
| State Executive Council | 28,011,175 |
| National Emergency Grant | 27,941,186 |
| Social Services Block Grant | 11,157,944 |
| Disaster Unemployment Assistance | 6,681,951 |
| CEBA Disaster Recovery | 4,305,000 |
| Crisis Counseling Grant | 2,665,429 |
| DNR Flood Plain Mng. and Dam Safety | 2,000,000 |
| Watershed Improvement Review Board | 2,000,000 |
| State Scholarship and Grant Reserve Fund | 500,000 |
| National Endow. for the Arts Emerg. Support | 100,000 |
| Administration on Aging | 57,818 |
| Total | $3,346,534,159 |

It would be incorrect to assume that the entire $3.35 billion has all been spent and has worked its way through the Iowa economy. According to RIO data, $2.34 billion had been spent or otherwise accounted for as of 9 July 2010. The spending of remaining appropriated resources might actually span many years, and not just the first year or two after the disaster. For example, the Iowa Finance Authority

values in Table 9 indicate $502.7 million in appropriated aid, but the vast majority of those funds are tax credits for low income housing providers that would be claimed over a very long period of time. Without actual audited data, it is not possible to know exactly when funds were or will be expended.

The timing of spending is an important consideration for any recovery-related impact summaries. In modeling the public spending, it is useful to determine the kind of activity that is funded by the assistance and then determine whether that activity was likely provided early in the disaster or later. For example, Table 10 gives us a sense of early disaster assistance funding dedicated to rebuilding or restoring public facilities and cleaning up damage.

Table 10

**Estimated FEMA Public Assistance Spending in Year One**

| | |
|---|---|
| Buildings | 44% |
| Utilities | 24% |
| Emergency Protective Measures | 14% |
| Roads and Bridges | 7% |
| Debris Removal | 6% |
| Parks and other infrastructure | 2% |
| Water Control Facilities | 1% |
| Other | 2% |
| Total | 0% |

It is further useful to be able to break down all spending from all sources considering the actual economic activity that was taking place as well as estimating whether the projects were conducted, in the main, in one year, two years, or three years. Table 11 gives a summary description of the categorization of all forms of assistance used for the purpose of I-O modeling the number of years the activity is modeled in the following exercise.

- Construction activity is assumed, given the scope and pace of rebuilding, to take as long as three years. Most public infrastructure spending is allocated into the first two years, and housing and business construction activity is expected to happen over a three year cycle.
- The modeling assumes that funds allocated to assist local and state governments in the management of recovery should be separately modeled so that the size and the value of that effort are acknowledged. Those costs will be borne primary throughout the three year measurement cycle in the foregoing analysis.
- Assistance was authorized for the purposes of individual and family medical assistance, counseling, and other critical personal services for disaster victims. While these payments may have been made directly to state agencies, they are modeled as medical services to individuals. These payments are expended over a two year period, with the majority of aid realized in the first year.
- Rental assistance for victims is given a two year cycle, albeit front-loaded in year one, and those payments are modeled as directly boosting the real estate sector.

- Because businesses must restock, reequip, and retool, portions of SBA assistance to businesses are allocated to broadly defined wholesale purchases. The modeling assumes that activity occurs over a three year cycle.
- Last, the nature of aid indicates emergency assistance payments were made directly to households as well as initial agricultural disaster assistance to farmers. Those values are all allocated into first year of activity.

Table 11

**Assumptions on the Spending of Appropriated Disaster Assistance Funds**

| | Year 1 | Year 2 | Year 3 |
|---|---|---|---|
| Construction: public infrastructure, businesses, homes, and maintenance and repair | X | X | X |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | X | X | X |
| Medical: payments in support of general health care, counseling, and personal services for victims | X | X | |
| Rents: government supported rental payments for victims | X | X | |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | X | X | X |
| Households: payments made directly to households to support household spending | X | | |
| Proprietors: primarily payments to ag land owners | X | | |

Table 12 summarizes the modeled disaster assistance values by category by year of spending. Only the appropriated amounts are modeled with the preponderance of spending in year 1 and lesser amounts, incrementally, in years 2 and 3. This is not an audit of when the expenditures actually occurred; instead, it is a basic allocation of likely spending across time for the purposes of distributing the recovery-related economic values over time as well. In all, the multiple detail sum to $2.4 billion in appropriated assistance over the measurement period. This is significantly less than the $3.35 billion total reported by RIO in Table 9, but is very close to the amount that RIO reports has been spent. All Iowa Finance Authority tax credit values were removed as those values will be paid out over a long period of time, and substantial fractions of buy-outs were removed as they would have been used to offset existing debt or restore net worth, but would not have translated into actual spending over the measurement period.

Table 12

**Direct Disaster Appropriated Assistance by Funding Category**

| Recovery Activity | Year 1 | Year 2 | Year 3 |
|---|---|---|---|
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 806,882,644 | 806,882,644 | 454,376,340 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 40,080,482 | 38,665,783 | 36,001,956 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 9,969,005 | 3,733,187 | - |
| Rents: government supported rental payments for victims | 136,330,160 | 13,926,307 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 3,802,999 | 3,802,999 | 3,802,999 |
| Households: payments made directly to households to support household spending | 46,548,128 | - | - |
| Proprietors: primarily payments to ag land owners | 25,497,221 | - | - |
| Total | $1,069,110,640 | $867,010,921 | $494,181,294 |

Table 13 provides the total outcomes of modeling the direct values by category contained in Table 12. Looking only at the first year's activity, $1.07 billion in appropriated assistance would have directly required 8,573 jobs making $385.98 million in labor income. All of those activities would have stimulated an additional $652.04 million in indirect and induced output in the Iowa economy supporting an additional 8,118 jobs making $204.99 million in labor incomes. The complete worth of all of that activity in recovery year one to the Iowa economy was the equivalent of $1.72 billion in statewide industrial output and $590.97 million in labor income to 16,691 jobs. Readers would use the same interpretation steps for each subsequent year. Readers are also strongly reminded that while the sum of all direct aid and assistance can be compiled for multiple years, it is incorrect to sum the indirect or

the total economic impact values over multiple years to attempt to achieve an aid-related grand total. The jobs that were supported in year one, for example, depended initially on $1.07 billion in aid. For those jobs to not disappear at the end of that funding year, more aid must be expended. The values are therefore annual equivalents. It is appropriate, however, to average the values over a multiple year period. By so doing, one could rightly claim that $2.4 billion in (assumedly) spent appropriations of the kind modeled in this exercise supported an annual average of 13,097 Iowa jobs for each of three years.

Table 13

**Economic Impact Values of Modeled Appropriated Disaster Assistance Funds**

| | Year 1 | Year 2 | Year 3 |
|---|---|---|---|
| | | *Direct Values* | |
| Output $ | 1,069,110,640 | 867,010,921 | 494,181,294 |
| Labor Income $ | 385,976,591 | 348,246,387 | 206,959,442 |
| Jobs | 8,573 | 6,813 | 3,958 |
| | | *All Indirect and Induced Values* | |
| Output $ | 652,041,077 | 575,746,632 | 330,154,902 |
| Labor Income $ | 204,990,665 | 184,870,650 | 105,885,797 |
| Jobs | 8,118 | 7,532 | 4,299 |
| | | *Total Values* | |
| Output $ | 1,721,151,717 | 1,442,757,553 | 824,336,196 |
| Labor Income $ | 590,967,256 | 533,117,037 | 312,845,239 |
| Jobs | 16,691 | 14,345 | 8,257 |

Detailed categorical tables by direct, indirect, and total amounts by year are contained in an appendix to this report.

## Conclusion

This report categorized Iowa's 2008 weather-impacted counties into 3 groups representing areas of high damage, medium damage, and low damage. That categorization was then used to compile sets of weighted average measures of economic performance before, during, and after those devastating events. Our evaluation of available data failed to discover conclusive evidence of measurable and lasting reductions in overall industrial production or household consumption due to the disasters, although there were obviously very harsh short-term consequences.

This research did not detect strong evidence of net population loss in the areas with the highest impacts. The evidence was compelling that there was a measurable short-term boost in unemployment and layoffs, but in all of the county groups, those flood-related boosts in unemployment were dwarfed by the onset of the recession within a month or two. We do not see evidence that the flood counties posted higher unemployment rates in the recession than would have been expected.

Employment actually expanded in the short-term in both the high and medium impact county groups. New hires were trending downward in the medium and high impact counties prior to the floods, but it appears that flood cleanup and repair employment slightly boosted new hire activity temporarily.

The analysis of business firm changes among all three county groups failed to demonstrate a significant reduction in the number of private establishments with employees. Retail trade in fact spiked during the recovery period due in large part to the need to replace household and business goods. Because measurable losses are not evident in either population or employment levels, even in the high impact counties, we conclude that much of the retail and service activity lost by damaged establishments shifted to unaffected firms. We also suspect that firms that were temporarily idled might have increased production levels once coming back on line.

An absence of compelling evidence of the amounts of net reductions in statewide productivity precludes a confident determination of total disaster-related economic impacts for the state of Iowa. Our inability to arrive at such a conclusion, however, is not meant to minimize or disregard the obviously devastating localized losses that were borne by the disaster-affected households, governments, and businesses. While we are unable to arrive at regional or statewide net economic impact conclusions, we recognize there were sets of localized economic impacts that planners and elected officials may need to quantify. To assist in that effort, this research posted sets of indexed economic impact table that can be used to approximate the consequences of localized permanent economic losses among retail, service, rental, and food manufacturing firms.

Iowa's agricultural sector ended 2008 with substantially higher net farm incomes than the year previous. We determined that the previously feared high losses to Iowa agriculture were substantially less than might have been initially assumed, and those losses were significantly offset by crop insurance indemnity payments and targeted federal disaster assistance.

Finally, this study estimated the total labor income and job impact values of the vast array of public assistance that flowed into Iowa households, businesses, and governments to recover from the

weather-related disasters. The nearly $2.4 billion in analyzed recovery-related appropriations were estimated to have supported the equivalent of 16,700 Iowa jobs in the first year of recovery, and 14,350 in the second year of recovery. These recovery impacts will have worked to significantly offset, on a regional and statewide basis, private and public sector losses and very likely offset recessionary losses as well.

## Data Notes

Several spreadsheets were obtained directly from or downloaded from the Rebuild Iowa Office web site for use in this report. Of most importance to Section 3 was the downloadable disaster relief funding spreadsheet, 9 July 2010. Additional, but unpublished an only preliminarily summarized data on losses were obtained from the U.S. Small Business Administration and the Iowa Department of Revenue and Finance.

Data on agricultural impacts and consequences were obtained from the USDA with interpretive guidance by Chad Hart, Department of Economics, ISU.

The indirect economic outcomes section of the report, Section 1, relied extensively on county secondary data from the Bureau of Labor Statistics, the Census Bureau, the Iowa Department of Revenue, the Iowa Department of Education, and the Iowa Department of Management.

Economic impact summaries were conducted using data and software procured from MIG, Incorporated, which are used to compile the Iowa Economic Impact Model that is maintained at Iowa State University.

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# Appendix: Detailed summaries of public aid short term direct economic impacts

| Direct Disaster Spending Output Impacts | | | |
|---|---|---|---|
| Recovery Activity | Year 1 | Year 2 | Year 3 |
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 806,882,644 | 806,882,644 | 454,376,340 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 40,080,482 | 38,665,783 | 36,001,956 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 9,969,005 | 3,733,187 | - |
| Rents: government supported rental payments for victims | 136,330,160 | 13,926,307 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 3,802,999 | 3,802,999 | 3,802,999 |
| Households: payments made directly to households to support household spending | 46,548,128 | - | - |
| Proprietors: primarily payments to ag land owners | 25,497,221 | - | - |
| Total | 1,069,110,640 | 867,010,921 | 494,181,294 |

| Direct Disaster Spending Labor Income Impacts | | | |
|---|---|---|---|
| Recovery Activity | Year 1 | Year 2 | Year 3 |
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 308,527,878 | 308,527,878 | 173,739,972 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 35,386,897 | 34,137,865 | 31,785,983 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 4,773,917 | 1,787,734 | - |
| Rents: government supported rental payments for victims | 23,097,328 | 2,359,423 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 1,433,487 | 1,433,487 | 1,433,487 |
| Households: payments made directly to households to support household spending | 9,099,042 | - | - |
| Proprietors: primarily payments to ag land owners | 3,658,040 | - | - |
| Total | 385,976,591 | 348,246,387 | 206,959,442 |

| Direct Disaster Spending Job Impacts | | | |
|---|---|---|---|
| Recovery Activity | Year 1 | Year 2 | Year 3 |
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 5,887 | 5,887 | 3,315 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 689 | 665 | 619 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 293 | 110 | - |
| Rents: government supported rental payments for victims | 1,250 | 128 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 23 | 23 | 23 |
| Households: payments made directly to households to support household spending | 303 | - | - |
| Proprietors: primarily payments to ag land owners | 127 | - | - |
| Total | 8,573 | 6,813 | 3,958 |

# Appendix: Detailed summaries of public aid short term indirect and induced economic impacts

| Indirect and Induced Disaster Spending Output Impacts | | | |
|---|---|---|---|
| **Recovery Activity** | **Year 1** | **Year 2** | **Year 3** |
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 542,881,133 | 542,881,133 | 305,710,308 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 24,836,232 | 23,959,601 | 22,308,936 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 6,860,659 | 2,569,176 | - |
| Rents: government supported rental payments for victims | 41,125,901 | 4,201,066 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 2,135,658 | 2,135,658 | 2,135,658 |
| Households: payments made directly to households to support household spending | 25,042,893 | - | - |
| Proprietors: primarily payments to ag land owners | 9,158,602 | - | - |
| Total | 652,041,077 | 575,746,632 | 330,154,902 |

| Indirect and Induced Disaster Spending Labor Income Impacts | | | |
|---|---|---|---|
| **Recovery Activity** | **Year 1** | **Year 2** | **Year 3** |
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 174,938,935 | 174,938,935 | 98,512,607 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 7,433,647 | 7,171,265 | 6,677,211 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 2,088,706 | 782,177 | - |
| Rents: government supported rental payments for victims | 12,552,872 | 1,282,293 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 695,979 | 695,979 | 695,979 |
| Households: payments made directly to households to support household spending | 5,097,765 | - | - |
| Proprietors: primarily payments to ag land owners | 2,182,761 | - | - |
| Total | 204,990,665 | 184,870,650 | 105,885,797 |

| Indirect and Induced Disaster Spending Job Impacts | | | |
|---|---|---|---|
| **Recovery Activity** | **Year 1** | **Year 2** | **Year 3** |
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 7,225 | 7,225 | 4,069 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 235 | 227 | 211 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 62 | 23 | - |
| Rents: government supported rental payments for victims | 371 | 38 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 19 | 19 | 19 |
| Households: payments made directly to households to support household spending | 144 | - | - |
| Proprietors: primarily payments to ag land owners | 61 | - | - |
| Total | 8,118 | 7,532 | 4,299 |

# Appendix: Detailed summaries of public aid short term total economic impacts

| Total Disaster Spending Output Impacts | | | |
|---|---|---|---|
| **Recovery Activity** | **Year 1** | **Year 2** | **Year 3** |
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 1,349,763,777 | 1,349,763,777 | 760,086,648 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 64,916,714 | 62,625,384 | 58,310,892 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 16,829,664 | 6,302,363 | - |
| Rents: government supported rental payments for victims | 177,456,061 | 18,127,373 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 5,938,657 | 5,938,657 | 5,938,657 |
| Households: payments made directly to households to support household spending | 71,591,022 | - | - |
| Proprietors: primarily payments to ag land owners | 34,655,823 | - | - |
| Total | 1,721,151,717 | 1,442,757,553 | 824,336,196 |

| Total Disaster Spending Labor Income Impacts | | | |
|---|---|---|---|
| **Recovery Activity** | **Year 1** | **Year 2** | **Year 3** |
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 483,466,813 | 483,466,813 | 272,252,579 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 42,820,544 | 41,309,131 | 38,463,193 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 6,862,623 | 2,569,911 | - |
| Rents: government supported rental payments for victims | 35,650,200 | 3,641,715 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 2,129,466 | 2,129,466 | 2,129,466 |
| Households: payments made directly to households to support household spending | 14,196,807 | - | - |
| Proprietors: primarily payments to ag land owners | 5,840,801 | - | - |
| Total | 590,967,256 | 533,117,037 | 312,845,239 |

| Total Disaster Spending Job Impacts | | | |
|---|---|---|---|
| **Recovery Activity** | **Year 1** | **Year 2** | **Year 3** |
| Construction: public infrastructure, businesses, homes, and maintenance and repair | 13,113 | 13,113 | 7,384 |
| Governments: payments to governments to directly provide government services or to administer disaster efforts | 924 | 892 | 830 |
| Medical: payments in support of general health care, counseling, and personal services for victims | 355 | 133 | - |
| Rents: government supported rental payments for victims | 1,621 | 166 | - |
| Wholesale: estimated inventory and business equipment purchased using government sponsored loans | 42 | 42 | 42 |
| Households: payments made directly to households to support household spending | 447 | - | - |
| Proprietors: primarily payments to ag land owners | 189 | - | - |
| Total | 16,691 | 14,345 | 8,257 |