

# **Final Report on the 1998 Pilot Land Use Inventory**

## **Land Use in Iowa: 1983-1998**

For the **Iowa Commission on Urban Planning, Growth Management, and Protection of Farmland**, Legislative Service Bureau, Des Moines, Iowa

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## **Executive Summary**

### ***Introduction***

The primary purpose of this pilot inventory was to determine the extent to which land in this state has been converted from agricultural use to residential, commercial, industrial, or public uses (including recreational areas, natural areas, and public facilities and infrastructure), and to report on the quality of agricultural land converted to these uses. The Iowa State University research team identified four principal objectives to be met by the end of the project:

- Involve the public and public officials
- Assess statewide needs and trends
- Inventory land-use changes since 1983
- Quantify agricultural quality of land converted from agricultural use

Project components included the following:

- Conduct a telephone survey of officials in all 99 Iowa counties
- Analyze statewide changes in assessment classification
- Schedule meetings of county and state officials
- Inventory agricultural land converted in the seven pilot counties
- Quantify agricultural quality of land converted in the seven pilot counties

The first and second components, which involved all 99 Iowa counties, represent work not required by the contract, but the project team considered them important in providing context for interpreting the results of the other components.

The counties that expressed interest in participating in this study represented a good cross-section of Iowa counties and thus were selected for inclusion in the land-use

inventory. The counties represent an adequate mix of urban and rural areas and levels of growth pressure as well as geographic location. The seven pilot study counties were Bremer, Cerro Gordo, Dallas, Monroe, Pottawattamie, Scott, and Story.

### ***Project components***

**1. Statewide telephone survey.** During the period from September 21 to October 23, 1998, the ISU project team conducted a survey of county zoning administrators and assessors with the goal of providing decision-makers with up-to-date information on land use changes across the state. The land use survey was designed to gain the following information relating to land use policy across the state:

- Identify methods and procedures for valuation of agricultural land
- Farmland protection strategies that are in place in counties
- Procedures for recording and monitoring land use changes at the county level
- Local issues and concerns in regard to land use changes taking place in Iowa's 99 counties

The results of the telephone survey are based on the responses elicited from 98 county assessors and 60 county zoning administrators and on observations made by Iowa State University researchers during county visits for data gathering. One hundred fifty-eight out of 164 potential subjects participated in the survey, with an overall response rate of 96 percent. Ninety-eight of 99 assessors participated with a response rate of 99 percent (one refusal). Sixty out of 65 zoning administrators participated with a response rate of 92 percent. These response rates are considered very high for this type of survey.

### ***Results***

**Agricultural land valuation.** The most common index used for agricultural land valuation throughout the state's 99 counties is the corn suitability rating (CSR) system. Some counties use a combination of CSR, crop yield and Land Capability Class to determine agricultural land valuation.

**Monitoring farmland change.** Most Iowa counties use the state-mandated reconciliation report to monitor changes in farmland. Some counties use other monitoring systems, including visual inspections, real estate transactions, property assessment cards, active zoning, aerial photos, geographic information systems (GIS), plat books, and so forth.

**Farmland protection programs and strategies.**

Forty-four counties have farmland protection programs or strategies in place. The most common state-level farmland protection strategies in effect among the sample counties are agricultural zoning district and conservation easement. Among the local-level programs, comprehensive planning and agricultural protection zoning are the most common.

**Issues of concern related to farmland protection.**

Overall, both groups of respondents (65 percent of zoning administrators and 40 percent of assessors) were concerned about the rate of urban growth in their counties. They indicated that efforts should be made to preserve prime agricultural land from being transferred to other uses. However, there was a surprising difference between the two groups' perceptions about the issue of farmland protection, indicating how complex an issue it is.

**2. Statewide changes in assessment classification.**

Statewide land use changes were reflected in data collected by the Iowa Department of Revenue and Finance (IDRF) and analyzed by ISU researchers as part of this study. Assessment classification is based on primary use of land parcels. Common assessment classes include the following:

- Agricultural
- Residential
- Commercial
- Industrial
- Exempt
- Other

In addition to these six common classes, some county assessors include other classes, such as forest reserve, rural residential, and annexed. Because incidental uses are permitted in each class, assessment classification indicates only primary use. Mixed use can occur in each class and is particularly common in the exempt class. Because mixed use is permitted, assessment class is therefore considered an indicator of land use, rather than a direct measure of land use.

***Results***

**Change from agricultural to nonagricultural classes.** Statewide data from reconciliation reports were available from the IDRF for the period 1986 to 1997. Parcels that changed from the agricultural class to a nonagricultural class (that is, residential, commercial, industrial, exempt, or other) totaled 480,567 acres and had a total assessed value of \$314,781,679.

Each year since 1986 (except 1993), more land area changed from the agricultural class to the unincorporated exempt class than to any other class increasing from 13,615 acres in 1986 to 22,601 acres in 1997. This change reflects a rate of increase of approximately 750 acres per year. Each year since 1986, the assessed value of land that changed from the agricultural class to the unincorporated residential class was higher than any other class. The area that changed from the agricultural class to the unincorporated residential class increased in total assessed value from \$7,934,167 in 1986 to \$14,952,743 in 1997. The rate of increase was approximately \$585,000 per year.

The unincorporated residential class ranked second in each year except 1993, when its total exceeded the unincorporated exempt class. This class increased from 6,237 acres in 1986 to 16,566 acres in 1997, a rate of increase of approximately 860 acres per year. The unincorporated exempt class ranked second in each year. The area that changed from the agricultural class to the unincorporated exempt class increased in total assessed value from \$5,130,491 in 1986 to \$9,969,625 in 1997. The rate of increase was approximately \$403,000 per year.

This same IDRf report revealed that, from 1988 to 1997, the seven pilot counties selected for this study contained parcels that changed from the agricultural class to a nonagricultural class totaling 53,801 acres with a total assessed value of \$34,072,770.

**Change from nonagricultural to agricultural class.**

Parcels that changed from a nonagricultural class to the agricultural class statewide between 1986 and 1997 totaled 165,848 acres and had a total assessed value of \$212,661,997.

- The area that changed to the agricultural class from the unincorporated exempt class decreased from 10,516 acres in 1986 to 653 acres in 1997.
- The area that changed to the agricultural class from the unincorporated exempt class increased from 3,301 acres in 1986 to 4,221 acres in 1997.
- The area that changed to the agricultural class from the unincorporated residential class increased from 2,601 acres in 1986 to 3,460 acres in 1997.
- Each year since 1986, the assessed value of land that changed to the agricultural class from the unincorporated residential class was higher than to any other class. The area that changed

to the agricultural class from the unincorporated residential class increased in total assessed value from \$5,397,369 in 1986 to \$11,726,155 in 1997.

**Net change from agricultural to nonagricultural classes.** The net change in parcels that changed from the agricultural class to a nonagricultural class between 1986 and 1997 totaled 314,719 acres and had a total assessed value of \$102,119,682. In the seven pilot counties from 1988 to 1997, parcels that changed from the agricultural class to a nonagricultural class had a net total of 35,979 acres and had a net total assessed value of \$14,128,871

**Land use in incorporated areas.** According to land use data collected from 1975 to 1984, incorporated areas in Iowa contained nearly equal amounts of agricultural land use and nonagricultural land use.

**3. Meetings with state and county officials.** Two Iowa Communications Network (ICN) sessions were scheduled to allow state and county officials and interest groups to comment on the study and inform the research. The first of these was held September 23, 1998. The second was held November 18, 1998. Each meeting gave the Iowa State University team an opportunity to provide updates on the progress of the land use inventory and to solicit information regarding participants' concerns and interests. At the second session, draft recommendations and conclusions were discussed and evaluated. The results of these discussions are found in Appendices B1 and B2.

**4. Seven-county land conversion study.** A preliminary visit to the seven pilot counties selected was made to determine the kind of data available and the staffing required to gather the data for use in this inventory. In addition to county assessors, three of the pilot counties had separate city assessors: Ames (Story County), Davenport (Scott County), and Mason City (Cerro Gordo County). The land use change data for these cities were gathered separately from their respective counties.

### ***Results***

**Data gathering.** In four of the seven counties (Bremer, Cerro Gordo, Dallas and Scott), the ISU research team entered the data. Data entry in Cerro Gordo and Dallas counties was done in the assessor's office, while data entry for Bremer and Scott counties was done at Iowa State University. For each county, it took an average of two to three full days for three persons to enter data into an MS Excel spreadsheet.

**Data format.** Data for three counties were provided to the research team in digital form (Monroe, Pottawattamie, and Story). Some of the data were in spreadsheet format and some in database format. Pottawattamie County data, which were in FileMaker Pro format, were converted into Microsoft Excel format for debugging.

**Debugging techniques.** Once the data for each city and county had been entered, a series of debugging techniques were used to test their accuracy. The first level of debugging done was to determine whether any data were missing. The county or city assessor was contacted to supply/verify the missing information. The second level involved finding duplicate data (parcel number and legal descriptions) using the FileMaker Pro program. The third level of debugging involved determining the reliability of the data. When very high or very low values were generated, assessors were asked to verify the accuracy of the data. The final data set was submitted for analysis and digitizing.

**Data variations.** The seven counties were found to record different kinds and amounts of data, maintain records in different formats for different lengths of time and store them in different locations. For example, some records are kept in full-sheet and half-sheet assessment cards, some in digital format, and some as computer printouts. Sometimes it was difficult for researchers to determine whether an actual land use change had taken place; in these cases, researchers relied on other methods to confirm any actual change in land use.

Four of the pilot study counties (Cerro Gordo, Dallas, Pottawattamie and Scott) have records of farmland change from 1982 to 1998. Bremer County had 10 years of data related to farmland change (1988 to 1998) available to researchers. Story County has data from 1983 to 1998, and Monroe County's data ranges from 1987 to 1998.

**Data limitations.** Because the data varied widely from county to county, it was difficult to compare one county with the others in a meaningful way. There was no standard record-keeping system among the pilot counties; some maintain records from as far back as 1982 and earlier, while others keep only more recent records. The amount of detail included on the assessment cards and printouts also varies from county to county. In some cases, this led researchers to spend a great deal of time verifying what type of transaction had taken place for each parcel.

The data gathered from the seven counties cannot be considered a complete list. Some of the complexities involved splits. Also, county assessors have different ways of classifying property. For example, Bremer County places forest reserve designations in the exempt category, while Dallas and Monroe counties consider forest reserve to be a separate

classification. Pottawattamie County has a separate entry or classification for land that has been annexed, but for other counties, annexed land falls under a residential class change.

**Acres converted.** Of the four counties for which 17 years of data (from 1982 to 1998) on land use change were available, Dallas had the greatest number of total acres (11,851 acres) converted from agricultural use to other uses, followed by Pottawattamie (6,825.6 acres), Scott (3,454.5 acres), and Cerro Gordo (5,958.9 acres).

A comparison between the statewide data and data for the seven pilot counties reveals that the pilot counties see a higher-than-average amount of agricultural land (382.77 acres per county) converted per year. The statewide average is 264.9 acres per county per year. Statewide data are based on Iowa Department of Revenue and Finance data collected from reconciliation reports between 1986 to 1997.

To present a consistent picture of what is taking place in the seven counties, counties were compared with each other based upon acres converted from 1988 to 1998. A total of 34,577.41 farm acres were converted into different uses from 1988 to 1998 for the seven counties. Of the total acres, 52 percent were converted into residential use, 24 percent to exempt, 9 percent to forest reserve, 8 percent to commercial use, 4 percent annexed and nearly 1 percent to rural residential or industrial use.

Dallas County had the largest area converted from agricultural to residential use (5,699.2 acres), followed by Pottawattamie (4,129.4 acres), Story (2,903.5 acres) and Bremer (2,201.5 acres). Scott, Monroe and Cerro Gordo counties had 1,822, 1,157.64 and 186.8 acres converted into residential use, respectively. Monroe County had the highest number of acres of farm area converted to industrial use, while Pottawattamie had the greatest number converted to commercial use and Cerro Gordo County had the largest number of exempt parcels. Only Pottawattamie and Story counties indicated they have some agricultural areas that were annexed.

**Trends and changes over time.** Most of the agricultural conversion within the seven counties took place between 1989 and 1997. Dallas County consistently had the most agricultural land converted to other uses from 1989 to 1994, with its peak amount of conversion occurring in 1996, 1994 and 1993. The rate of conversion tapered off in 1995, but increased from 1996 to 1997. Cerro Gordo County saw most of its conversions in 1995, 1997 and 1996. Bremer County had its peak of conversion in 1997, Monroe in 1994, and Pottawattamie in 1995. For an individual county, no pattern was seen in the amount of agricultural land conversion. It fluctuated from year to year.

From 1993 to 1994, all seven counties experienced an increase in agricultural conversion ranging from 0.01 percent (Bremer) to 13.27 percent (Monroe). However, from 1996 to 1997, agricultural conversion decreased for four counties (-10.89 for Story -5.49 for Dallas, 3.19 for Pottawattamie, and -0.98 for Scott). It is also in these years where Bremer had the highest increase in agricultural conversion (+26.87 percent).

Bremer had the highest increase in agriculture conversion from 1996 to 1997 (+26.87 percent), Cerro Gordo from 1994 to 1995 (+13.3 percent), Dallas from 1995 to 1996 (+5.48 percent), Monroe from 1992 to 1993 (+12.4 percent), Pottawattamie from 1994 to 1995 (+4.45 percent), Scott from 1993 to 1994 (+6.28 percent), and Story from 1997 to 1998 (+18.47 percent).

The peak rate of conversion of agricultural land to residential use was experienced by the seven counties from 1994 to 1997. In Story County, most conversion occurred in 1998, while the same was true for Bremer County in 1997, Dallas in 1996, Pottawattamie and Cerro Gordo in 1995, Scott and Monroe in 1994. The data indicate that conversion to commercial use in Story County occurred mostly in 1985, while the same was true for Pottawattamie County in 1995 and 1996, Scott in 1995, and Cerro Gordo in 1983.

**5. Seven-county agricultural quality study.** In this study, data on soil characteristics were used as the primary measure of relative potential for agricultural use. In addition, survey data on farmland value provided context and a basis for comparing measures from soil characteristics. The agricultural quality of land converted from agricultural use to nonagricultural use was measured using four soil survey interpretations: Corn Suitability Rating (CSR), Estimated Corn Yield (ECY), Land Capability Class (LCC) and USDA Prime Farmlands classification.

### ***Results***

**Parcel area.** Of the 4,005 parcels (totaling 48,564 acres) included in the study database for seven pilot counties, 2,567 parcels (totaling 36,931 acres) had a land use change and 1,438 parcels (totaling 11,633 acres) had no land use change even though the assessment class changed.

Of the 2,567 parcels (totaling 36,931 acres) that had a land use change, 1,463 parcels (totaling 32,417 acres) were digitized and 1,104 parcels (totaling 4,464 acres) were not digitized due to incomplete data. Approximately 57 percent of the parcels in which land use changed were digitized. These digitized parcels included approximately 88 percent of the area in which land use changed.

In the seven pilot study counties, the number of acres converted from agricultural to nonagricultural classes averaged 336 acres per county per year. The values ranged from 129 acres per year in Bremer County to 592 acres per year in Scott County. By comparison, the average size farm ranges from 241 acres in Bremer County to 396 acres in Pottawattamie County. The seven-county average farm size is 335 acres and the Iowa average is 339 acres.

The majority (64 percent) of digitized parcels were converted from the agricultural class to the residential class. However, only 62 percent of the area was converted from the agricultural class to the residential class. Of the total area converted from agriculture, approximately 22 percent was converted to the exempt class. Approximately 5 percent of the digitized parcels and 5 percent of the parcel area was converted to other assessment classes (forest reserve, annexed, or other). These other assessment classes or designations were found in only a few of the seven pilot study counties and generally do not represent a land use change.

The average number of parcels per year increased slightly during the 1982 to 1998 study period. The average area of parcels per year decreased in the middle of the study period (74 acres per county in 1987), then increased again to an average of 406 acres in 1998.

**Parcel location.** For the 32,417 acres digitized in this study, approximately 67 percent were in incorporated areas or within 2 miles. Approximately 32 percent were located more than 2 miles from incorporated areas. These results indicate that, for the parcels digitized, non-farm development was not necessarily close to incorporated areas. This was particularly true given that the acreage in the 0-1 mile zone (10,791 acres) was almost the same as the acreage in the 2+ mile zone (10,382 acres).

For parcels changed to the industrial class, 70.2 percent of the area was in incorporated areas or within 2 miles. In contrast, only 52.0 percent of the exempt class was in incorporated areas or within 2 miles. This was a logical result given that industrial uses rely on urban services more than the variety of uses in the exempt class.

**Corn suitability rating (CSR).** For the parcels digitized in this study, the area-weighted average CSR was 57.6. For the entire area of all seven pilot counties, the average was 67.4, slightly above the state average. Average CSR in digitized parcels ranged from 39.2 in Monroe County to 68.1 in Story County. In each county, the CSR of digitized parcels was below the average CSR for the entire county. This indicates that the agricultural quality of parcels converted from agricultural to nonagricultural classes was below average in each county.

In the seven pilot counties, parcels converted to the commercial class had an average CSR of 57.1. The average CSR for the exempt class and residential class were similar to the CSR for the commercial class. In contrast, parcels converted to the industrial class had an average CSR of 72.6, much higher than the averages for the other classes. This indicated that industrial uses may compete with agriculture for high quality land. Soils that are high quality for agriculture are typically highly suited for industrial sites because of little slope, adequate drainage, and other mutually desirable soil characteristics.

**Estimated corn yield (ECY).** For the parcels in this study, the area-weighted average ECY was 106.8 bushels per acre. Average ECY in digitized parcels ranged from 76.9 bushels per acre in Monroe County to 121.3 bushels per acre in Story County. In each county, the ECY of parcels was below the average ECY for the entire county and also below the average ECY for Iowa. Among the assessment classes, parcels converted to the industrial class showed the highest ECY, 129.5 bushels per acre.

**Land Capability Class (LCC).** For the parcels in this study, approximately 47 percent of the acreage was classified by the USDA as Land Capability Class I or Class II. These two classes have few or no limitations for intensive agriculture.

The proportion of the area converted to the commercial, exempt, and residential classes classified as Land Capability Class I or Class II was approximately 49 percent. For the area converted to the industrial class, the proportion was 84.7 percent. This pattern was similar to those described earlier for CSR and ECY.

As with CSR and ECY, the long-term trend from 1982 to 1998 showed little change in the percentage of Class I and Class II land. The long-term average was between 45 and 50 percent Class I and Class II land.

**USDA Prime Farmland.** According to the USDA Prime Farmland classification, approximately 48 percent of the parcel area converted from agricultural to nonagricultural class was considered prime agricultural land. Approximately 26 percent was considered of state importance, 22 percent was of local importance, and 3 percent was not rated.

From 47.2 to 56.0 percent of the area converted to commercial, exempt, and residential classes was considered prime agricultural land by the USDA. In contrast, over 84 percent of the area converted to the industrial class was considered prime agricultural land by the USDA.

The average percentage of land classified as prime by the USDA showed no clear trend before 1991. However, beginning in 1991 there was an overall increase in the annual average and three-year moving average above 50 percent prime land.

**Story County.** Additional data analysis in Story County in three incorporation zones (incorporated, zero- to one-mile extraterritorial zone, and one- to two-mile extraterritorial zone) showed that the area weighted average CSR increased with distance from the incorporated zone, from 72.8 to 79.9. The area weighted average ECY also increased with distance from the incorporated zone, from 127.6 to 142.3. In contrast, the average CSR and average ECY decreased with distance from the incorporated zone for the parcels in each zone, except for parcels in the 2+-mile zone. Therefore, in general, as distance from incorporated areas increased in Story County, the agricultural quality of all land increased, but the agricultural quality of the parcels decreased.

Analyses of flood zones, hazard zones, and conservation zones also were completed for Story County. These analyses suggest additional applications of parcel data and GIS technology to land management. Emergency management, disaster preparedness, conservation planning, and other land management applications can benefit from data on land characteristics and land use changes. These data can be used to identify limitations and hazards that endanger public health, safety, and welfare. Information on limitations and hazards can be effectively used to protect both people and the environment, minimize expenditure of public funds, and increase the quality of life for Iowa's citizens.

**Assessment classification as an indicator of land use change.** Data on assessment class from county assessors were used in this study as an indicator of land use change. Data on assessment class provides an indirect measure of land use change for three reasons. First, a change in assessment class doesn't necessarily result in a change in land use. Second, assessment class is based on the principal land use in each parcel; by law, incidental land uses and mixed uses also are permitted. Third, the assessment class "exempt" is a better indicator of land ownership rather than land use.

Other data sources, such as field surveys and aerial surveys, provide a more direct measure of land use change than assessment class. However, these direct measures were not used in this study due to time and budget limitations.

How effective was assessment class in indicating land use change? One measure in this study was the number of parcels with a land use change compared to the number of parcels without a land use change. Of the total

4,005 parcels analyzed in this study, 2,567 (64 percent) had a land use change. Of the total 48,564 acres analyzed in this study, 36,931 (76 percent) had a land use change. Therefore, in this study assessment class change was from 64 to 76 percent effective as an indicator of land use change.

### ***Recommendations***

- **Digitize and analyze additional parcels in each pilot study county.** Most, but not all, parcels in which land use changed were included in this study. Because of data and time limitations, 57 percent of the parcels and 88 percent of the area that changed land use were digitized for this study. Though this sample of convenience provides sufficient data for conclusions about the vast majority of area that changed land use, it was biased toward larger parcels and parcels with complete data. Digitizing the remaining parcels in each pilot study county would provide a more representative sample on which to base conclusions.
- **Confirm land use changes in each pilot study county.** In some parcels that changed from agricultural to nonagricultural assessment classes (especially to residential and exempt classes), land use changed on only a portion of the parcel. An example is a municipal well field in Story County (now classified as exempt but used primarily for agriculture). Field surveys and aerial surveys could provide more detailed data that could be used to refine the results. Other parcels that change from agricultural to nonagricultural classes directly support agriculture. An example is a soybean plant in Pottawattamie County.
- **Monitor future land use changes in all counties.** An analysis of land converted from agricultural to nonagricultural use should be conducted every year or two. For example, the procedure used in this study could be institutionalized annually using data in each county assessor's reconciliation report to the Iowa Department of Revenue and Finance. In addition to reporting total acres and total assessed value (as is done currently), the number and location of individual parcels could be included in each county report. Such data, combined with aerial imagery, would provide even higher quality data and more consistent results.
- **Assist all counties in modernizing land records.** As shown in this study, digital parcel records become an efficient and powerful database for monitoring land use changes. Pilot counties with parcel records in digital form quickly provided data needed for this study. Another key to efficient data analysis is a digital parcel map. Several counties in Iowa, including Story County, already have a digital parcel map. Others are in the

process of creating one. Helping all counties create a digital parcel map and modernize their land records in a consistent way would make future monitoring much more efficient.

- **Inventory land use and resources statewide.** This study provides data and conclusions based on a sample of seven counties with a diversity of characteristics. Statewide inventories of land use and resources would provide more current and complete data on land use, agricultural quality of land, urban growth patterns, and population changes. For example, the agricultural quality of land in and near all incorporated areas could be mapped to provide guidance to public officials in making decisions about location of future development.
- **Interpret the results of future inventories and assessments in both a state and national context.** This would help determine the significance of rates of change as well as size and number of converted parcels/acres. An impartial steering committee could be appointed to effectively evaluate the findings of a statewide inventory. This would allow policy makers to gain a better understanding of the implications of land use change in the state.
- **Assist county personnel to ensure consistency in implementation of future land use inventories.** A common theme in the 1983 land use inventory reports was the variation in implementation of the inventory due to differences in opinion regarding proper methods to be used and the definitions of various land use types.
- **Apply data to other land management issues and needs.** Data on land use and resources are useful not only for agricultural applications but also for a variety of other land management applications. As shown earlier in this report, such data can be used for emergency management, disaster preparedness, and conservation planning. Other applications include urban growth management, watershed planning, and water quality monitoring. Though some government agencies and nongovernmental organizations are already using geographic information system (GIS) databases and technology, many more would find these tools useful as they work to protect public health, safety, and welfare. Information produced from data on land use and resources can be effectively used to protect both people and the environment, minimize expenditure of public funds, and increase the quality of life for Iowa's citizens.