

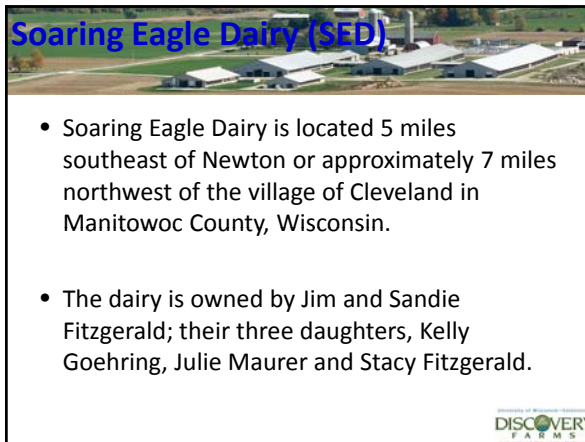
Understanding Nutrient & Sediment Loss at Soaring Eagle Dairy - 6

Impact of Discovery Farm Research

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Soaring Eagle Dairy (SED)



- Soaring Eagle Dairy is located 5 miles southeast of Newton or approximately 7 miles northwest of the village of Cleveland in Manitowoc County, Wisconsin.
- The dairy is owned by Jim and Sandie Fitzgerald; their three daughters, Kelly Goehring, Julie Maurer and Stacy Fitzgerald.

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Soaring Eagle Dairy (SED)



- The farm is located in the Point Creek subwatershed and the Lake Michigan watershed.
- Land surrounding SED mostly used for agricultural purposes, nearest residence approximately 500 feet to the northwest

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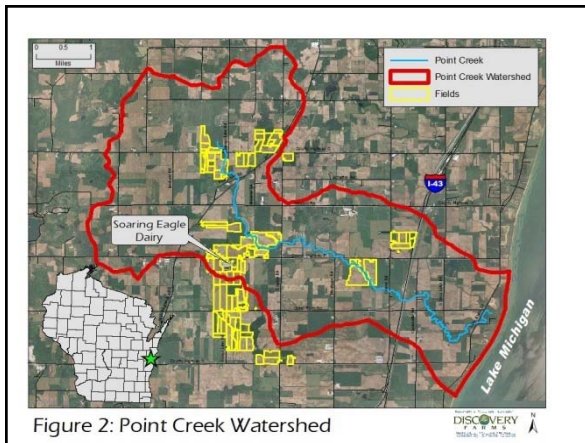


Figure 2: Point Creek Watershed

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Farm and site selection



- The selection criteria for this site included a strong emphasis on monitoring a relatively small watershed, so that the water quality data could be compared to data gathered from individual field sites.

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Farm and site selection



- This was done in order to determine the accuracy of using field data to estimate losses on a watershed scale.

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Equipment installation

- The installation of surface water monitoring equipment began in late July 2004.
- The site was difficult to install because of the high amounts of soil moisture contained in and around the intermittent stream.

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Equipment installation

- The installation was completed in late October 2004.
- First runoff event occurred in early December 2004.
- Equipment installation and sampling is outlined in SED – 3.

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Surface water monitoring

- Data collection at SED began in December of 2004 and was conducted until October 26, 2006.

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What changes occurred

- **How did data gathered at SED:**
 - increase producer knowledge,
 - improve the understanding of how agriculture impacts the environment, and
 - further determine site selection criteria for future on-farm research sites.

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Lessons Learned

- Typically in watersheds runoff exhibits a rapid response to rain or melting snow and then over a relatively short period of time (minutes to hours), the flow greatly diminishes and stops.
- Discovered that the majority of runoff appeared to be coming from subsurface tiles that emptied into the waterway above the monitoring site.

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Lessons Learned

- Concerns about the influence of tile on runoff include:
 - Much of the area drained by this tile was not under SED control - land and management practices were unknown
 - Drainage area for this tile was unknown
 - Some of the tile systems contained surface inlets, which greatly increase the potential for nutrients and sediment to run off into the site.

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Lessons Learned

- The data collected on this site provided valuable information that allows us to conclude that in this type of setting, the nutrient and/or sediment loss data from edge of field sites does not accurately scale up to represent losses at the watershed level.

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Lessons Learned

- This is because surface water runoff is just one of the two major sources of nutrients and sediment entering lakes and streams.
- Clearly demonstrates that tile drainage systems can contribute a significant amount of water to the watershed.

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Lessons Learned

- Drainage systems dramatically increase the volumes of water entering the watershed as well as the duration of runoff that occurs.

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Lessons Learned

- Drainage also dramatically changes the watershed boundaries from the surface drainage areas.
- The information gained at SED changed public perception and understanding of the importance of tile drainage systems in Manitowoc County.

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Changes at SED

- A waterway was mistakenly tilled through.
 - Better mapping of established waterways and increased communication between producer, crop consultant and custom manure hauler has been implemented to prevent this from happening in the future.


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Changes at SED



- Upon learning about potential losses through tile lines:
 - SED had a meeting with their custom manure applicator, crop consultant, SED and Discovery Farms staff to determine the best methods for manure application over tiled agricultural land.
 - A new application implement which creates better disturbance of the soil near the manure application site was constructed and used.

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Changes in public perspective

- Increasing the size of buffers will very likely have limited effect on reducing phosphorus losses
 - because of the high ratio of dissolved phosphorus to particulate phosphorus in runoff samples.
 - This research/discussion focused on identifying viable options for reducing dissolved phosphorus losses.



Changes in public perspective

- Discovery Farms data is skewed.
 - Rumors that Discovery Farms staff or farm personnel were modifying samples to hide bad results.
 - Shown that all testing is 100% automated, equipment is locked, and it is difficult to modify samples.
 - Only qualified Discovery Farms or USGS personnel have access to locked research sites and pictures of bottles for each storm event are taken at the laboratory.


Changes in public perspective

- Discovery Farms data is skewed.
 - Rumors that Discovery Farms staff or farm personnel were modifying samples to hide bad results.
 - Modifying samples to correspond to changes in flow would be extremely difficult, if not impossible.
 - Data was presented showing substantial losses under a wide variety of management systems and conditions.
 - Discovery Farms personnel were able to address this concern in subsequent meetings to the public.

Changes in public perspective

- Better methods to educate the public on environmental issues
 - A groundwater model was purchased to inform the general public on where drinking water comes from and the potential sources of contamination.
 - Discovery Farms staff attended county fairs and other public events to provide additional education.




Changes in public perspective

- Topics at committee meetings included:
 - monitoring challenges,
 - manure spill response procedures,
 - development of a soil moisture risk management assessment tool,
 - anaerobic digesters,
 - flush systems.




Changes in public perspective

- Topics at committee meetings included:
 - pathogen testing,
 - state and local agricultural regulations,
 - nutrient management planning, and
 - certification at the county level for custom manure haulers.





Changes in site criteria

- **Surface water and tile paired basin**
 - Where tile flow greatly influences surface water, concurrent testing of surface and tile in a basin are optimal to determine where sources of sediment and nutrients are originating.

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Changes in site criteria

- **Access to power (near lines or buildings)**
 - The site at SED was solar powered.
 - Because of the long flow duration (freeze/thaw periods), the site was often close to capacity for running the equipment and operation of the heat tapes.

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Changes in site criteria

- **Easy access by road (able to plow in winter)**
 - Without the access road at this site, monitoring in this location would have been much more difficult.

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Changes in site criteria

- **40 acre watershed or less**
 - The 295 acre watershed selected for this study proved to be challenging.
 - Management changes made on a field or a few fields in the watershed could be masked by the large volume of water.
 - Watersheds of ≤ 40 acres would be optimal for assessing land management changes.

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Changes in site criteria

- **Single field per watershed if possible**
 - Nutrient losses are difficult to link to specific crops, tillage, nutrient applications, and management practices.
 - A single field or fields with identical crop rotations in a watershed is optimal.
- But, in Wisconsin these are unlikely.


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Changes in site criteria

- **All/majority of agricultural land in watershed under control of participant**
 - Obtaining management records from producers has proven to be difficult.
 - Watersheds where management is unknown further complicates correlating sediment and nutrient losses to management practices.

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Changes in site criteria

- **No backwater (good slope away from surface site and clear discharge path for tile)**
 - Major obstacle was lack of slope downstream of the site.
 - This caused frozen backwater conditions that rendered the monitoring equipment ineffective.
 - It is crucial to ensure proper slope (get-away conditions) from the monitoring equipment.

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Changes in site criteria

- **Open and honest cooperators with good records**
 - SED had an immaculate recordkeeping system.
 - They were always available to share their records and management information with our staff.
 - Without cooperation and recordkeeping of what happened on the land, linking water quality data to land management is almost impossible.


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Changes in site criteria

- **Two paired surface/tile sites on same farm is optimal**
 - If funding and sites that meet the criteria are available, it is advantageous to have paired surface and/or tile sites.
 - Replication allows for better determination of the magnitude of specific events when compared to a control site where the event did not occur.
 - Replication also minimizes variation in data caused by climatic, environmental and physical factors.


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Information Available

- This presentation is the sixth in a series of six developed to provide the data and information collected at Soaring Eagle Dairy.
- All of the presentations, factsheets and briefs are available on the UW - Discovery Farms website.

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Information Available

- There are six factsheets available on SED.
- There are six briefs available on SED (2 page summaries of the factsheets).
- There are six presentation available on SED.

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For Additional Information

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