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OPENING REMARKS

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Good morning!  I am pleased to convene the Opening Session of the 2009 Governor’s Conference on the Management of the Illinois River System.  I am Kim St John with USDA – Natural Resources Conservation Service and I am serving as one of the co-chairs for this conference.  I am happy to say we have over 300 people registered for this conference; this is a marker for the tremendous interest in the protection of the Illinois River system.  It is wonderful to have such a diverse group of people coming together with a common interest in the Illinois River Watershed.

On behalf of the Planning Committee I welcome you to the 12th Biennial Governor’s Conference on the Management of the Illinois River System.  If anyone of us walked out the front door of this hotel a person on the street might ask “Why are the Illinois River and its watershed important?” Here are a few responses to share:

The Illinois River system is vital to our economy, environment, and society.  The river is our state’s most important and yet vulnerable inland waterway that stretches some 345 miles in length.  The watershed comprises over 44% of the area in Illinois along with portions of Wisconsin and Indiana and:

- It is home for us and 90% of Illinois’ population
- It feeds us with its agricultural bounty
- It transports commodities and products efficiently
- It awes us with its beauty
- It wows us with a wide array of wildlife
- It restores our spirits
- It is our playground with many recreational opportunities
- It binds us together with 54 Illinois counties draining into the Illinois River
- It quenches our thirst supplying drinking water for several communities
- And it physically links us to the rest of the world as a conduit from the Great Lakes to the Gulf of Mexico.

The theme of this conference is “Looking Back, Moving Forward”.  This conference and its eleven predecessors provide a forum to share successes, to learn about new technologies, and serve as catalyst for new collaborations to improve the overall health of the Illinois River basin.

For the next two days there will be conference speakers who will be covering a wide variety of topics.  During the plenary sessions we will be looking back at the very important Integrated Management Plan for the Illinois River Watershed with highlights on the accomplishments since its completion twelve years ago along with the legal interpretations of Illinois Water Law and its impacts in the watershed.  Our featured luncheon speakers will be U. S. Secretary of
Transportation, Ray LaHood, today and tomorrow David Zalaznik will share his beautiful photo presentation “Life Along the Illinois River”. The concurrent sessions will be showcasing the progress and advancements in both agricultural and community landscapes, the benefits derived from the ecosystem services, key projects in the river corridor, important water and sediment research and monitoring occurring in the watershed, and the vast economic development attributes of its natural resources. Along with these top-notch sessions there will be a digital technologies open house this afternoon that will provide an opportunity to see first-hand data resources, mapping, and measurement tools available via the Internet. There will be more time to catch up on advancements and available resources in the exhibit area and of course, great opportunities to network during the breaks, the luncheons, and at the casual dinner at the Gateway Building this evening.

The purpose of this conference is to bring together a diversity of disciplines, expertise, and viewpoints. During this conference I encourage each of you to share your interests and information, seek different opinions and viewpoints, meet new people, and catch up with colleagues. By tomorrow afternoon I am sure we all will gain greatly from whom we have met and what we have learned from one another.

The Governor of Illinois, the Honorable Pat Quinn, recognizes the tremendous importance of the Illinois River System to our state, the country, and the world and he realizes that we face many environmental challenges in protecting and improving the Illinois River System. On March 5th, 2009 Governor Quinn issued a special proclamation to communicate our state’s commitment to manage and care for this very important natural resource. The Proclamation reads as follows:

WHEREAS, the Illinois River is a critical component of our state’s geography, history, economy, and ecology, and

WHEREAS, many attributes are threatened as a result of the cumulative effects of human activities that have significantly altered the Illinois River system; and

WHEREAS, our state is embracing an integrated approach to large river management and is working in a coordinated and continuous manner for this river; and

WHEREAS, the implementation of the Illinois River Coordinating Council, the Conservation Reserve Enhancement Program, the Partners for Conservation Program, Illinois Rivers 2020, the Open Lands Trust Fund, the Mud to Parks Program, the Landowner Incentive Program, the Illinois Fish and Wildlife Action Plan, the Illinois Conservation Stewardship Program, the Illinois Conservation Climate Initiative, the Watershed Assessment and Restoration Program, and the Farm Bill Conservation Title are important milestones in efforts to protect the resources of the Illinois River; and

WHEREAS, the theme of the 2009 Conference on the management of the Illinois River System is “Looking Back, Moving Forward”; and

WHEREAS, the conference will be taking place October 20-22, 2009 at the Hotel Pere Marquette in Peoria, Illinois:

THEREFORE, I, Pat Quinn, Governor of the State of Illinois, do hereby proclaim October, 2009 as ILLINOIS RIVER MANAGEMENT MONTH in Illinois, and encourage citizens to recognize the economic, recreational, social, and environmental benefits of conserving to properly utilize the resources of the Illinois River basin.

This Proclamation will be on display in the main hallway throughout this conference, it can also be found in your conference program, and will be published in the conference proceedings.
We were honored to have Governor Quinn at the conference last evening for the Illinois River Coordinating Council when we were able to recognize him along with former Congressman Ray LaHood for their bipartisan efforts in the protection and enhancement of the Illinois River Watershed. An engraved rock has been placed just outside of the Gateway Building on the riverside to mark their exemplary efforts. Please take time to look at this during the evening gathering.

At this time I am honored to introduce my two fellow co-chairs for this conference, Bill White with Illinois State Water Survey and Bob Frazee with University of Illinois Extension. Both of these gentlemen have a wealth of knowledge and have provided outstanding leadership in the planning and implementation of this conference. Thank you both for your outstanding efforts.

The University of Illinois – Office of Conferences and Institutes is our administrative entity handling the registration, organization, and behind the scenes arrangements in making this a very successful conference. Michelle Chappell is the Administrative Coordinator and Michelle Marquart is a Program Specialist. We appreciate their efforts in organizing this conference.

This conference has been two years in the planning by a diverse committee of people representing state and federal government, non-governmental organizations, and community volunteers. These planning committee members are listed on pages 6 and 7 of your conference brochure. The planning committee has put together a first-rate conference for all. Would the planning committee members please stand and be recognized.

We are grateful to the sponsors that have provided a significant financial contribution to enhance the quality of this conference. The Platinum, Gold, Silver, Bronze and Financial Contributors are listed on page 8 of the conference brochure with a complete list in your conference bag. Also, there are conference supporters listed on page 8 of the conference brochure.

At this time I would like to recognize Nancy Erickson, Illinois Farm Bureau, and Scott Wallace, USDA-Natural Resources Conservation Service, for their terrific efforts with yesterday’s conservation tour that took participants to Emiquon, Dickson Mounds Museum, a wind farm, a US Geological Survey streamgaging station, and several other interesting sites. Thank you, Scott and Nancy for a great tour!

Last evening, it was our pleasure to host the quarterly meeting of the Illinois River Coordinating Council and its public forum. The Council shared their successes and continued vision for the Illinois River.

April Burgett and Aaron Yetter with the Illinois Natural History Survey co-chaired the exhibit committee. They have put together an excellent assortment of thirty displays in the Marquette North Ballroom. Thank you Aaron and April for developing this exhibit area.

The Digital Technologies Open House this afternoon is organized by Drew Phillips, Illinois Geological Survey, and Gary Johnson, U. S. Geological Survey. Many thanks to Drew and Gary for their skills in putting together this unique session.

Jennifer Fackler and Lisa Merrifield with University of Illinois compiled the very comprehensive Abstract and Speaker Information Book that you will find in your conference bag. This team is also developing the Conference Proceedings that will recap this entire conference. It will be available electronically in early 2010. We thank them for sharing their talents and expertise in
these endeavors. Throughout the conference please refer to the Abstract and Speaker Information Book for the agenda and more detailed information on each speaker’s topic and personal background.

I would like to bring your attention to one more item in your conference bag; it is a flash drive with an excellent publication, *A Decade of Changes in the Illinois River*. This publication was compiled and produced by Chris Davis, Illinois Environmental Protection Agency and Jody Christiansen and Jon Hubbert, USDA-Natural Resources Conservation Service, and edited by Marilyn Leyland, community volunteer and conference media coordinator. It is a document of stories that reflect the accomplishments and the continuing work of partners protecting the Illinois River Watershed that has been guided by the *Integrated Management Plan for the Illinois River Watershed* that was developed in 1997. Thank you for your labors in the development and production of this timely document.

At this time I would like to introduce two leaders from the City of Peoria Mayor Jim Ardis and Councilperson Bill Spears, to officially welcome us to the beautiful city of Peoria situated midway on the Illinois River between Chicago and Grafton. Thank you Mr. Ardis and Mr. Spears for your welcome and remarks.

Plenary Session One will be looking at 12 years of implementation of the *Integrated Management Plan on the Illinois River*. We are delighted that former Lieutenant Governor of Illinois, Bob Kustra, agreed to come back to Illinois from Boise, Idaho to be part of this conference. This plan was developed under his watch and leadership and has been a key guide for the progress that has occurred in the watershed. The moderator of this session is Senator David Koehler from the 46th Legislative District of the Illinois General Assembly. Senator Koehler serves as chair of the Local Government Committee and is a member of the Agriculture and Conservation, Energy, Higher Education, and Transportation committees. Senator Koehler will preside over our first Plenary Session. Thank you Senator Koehler.

Thank you Mr. Kustra for your lively and inspiring presentation including a retrospective of accomplishments and perspective for the continued bright future for the health of the Illinois River Watershed.

We will now have a break in the Marquette North Ballroom to learn, network, and enjoy some refreshments. The conference will resume at 10:15 am in this room for Plenary Session Two - Water Law and Court Interpretation. Kate Tomford, Director of Sustainability for the Office of Governor Pat Quinn, will moderate this distinguished panel of experts.
Plenary 1: 12 Years of Implementing the Integrated Management Plan

Bob Kustra,
Former Lieutenant Governor
State of Illinois
(presentation not available)
Plenary 2: Water Law and Court Interpretation

Historical Foundations of Illinois Water Law: Private and Public
Robert Beck
School of Law
Southern Illinois University

Illinois Agriculture and Water Law
Donald Uchtmann
University of Illinois at Urbana-Champaign

Water Pollution, Agriculture, and the Law (Or Lack of Law)
Albert Ettinger
Environmental Law and Policy Center
THE HISTORICAL FOUNDATIONS OF ILLINOIS WATER LAW: PRIVATE AND PUBLIC

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SURFACE WATERS

1819—Prologue

In the early 1800’s to build and operate a grist mill on a small stream in Illinois you needed to dam the stream to collect enough water to regularly turn the water wheel, and if you did not own land on both sides or a large enough tract for a reservoir, you had to get the consent of the appropriate landowner before you could build the dam or flood the land. Building or flooding without consent would be trespass and the standard remedy would be an injunction to stop the trespass.

By 1819, the General Assembly had seen a public purpose in, and a need for, grist mills so they passed a law regulating grist mills and allowing a person seeking to establish a water-powered grist mill to use the power of eminent domain to acquire a site for the dam abutment on the opposite shore and/or for the reservoir. Act Regulating Grist Mills and Millers (1819). In an Act passed in 1827, the General Assembly included both grist mills and saw mills. Act Regulating Mills and Millers (1827).

So often from, you might say, Day 1 of statehood to modern times, the General Assembly has passed statutes, such as the grist mill law, to facilitate a specific use of water for what the Assembly saw as serving an important public need at the time. This has included legislation to facilitate construction of canals and ports for commerce, disposal of Chicago sewage, development of municipal water supplies, draining of lowlands, flood control, water pollution control, Illinois River watershed restoration, and so on. Often these laws included provision for creating local districts or oversight committees to oversee the activities. However, never has the General Assembly passed a comprehensive water resource management statute for the entire state. Thus the common law, that is judge-made law, is still important in the management of Illinois water resources.

The foundation common law case on private rights in surface water was decided in 1842.

1842 -- “Private” Use

In 1834 Smith and Baker owned land abutting a small stream in Greene County on which they built a steam operated mill, converting water from the stream into steam. Around two years later Evans also built a steam operated mill on land he owned upstream of Smith and Baker. In the fall of 1837 there was a drought and an employee of Evans, the person upstream, diverted the entire stream to Evan’s mill. Merriweather, who had acquired ownership of the Smith & Baker mill, sued and in the December term of 1842, the Illinois Supreme Court decided what came to be a landmark case. Evans v. Merriweather (1842). The Court observed first, that natural wants would always trump artificial wants in the use of water and that natural want users can fill their wants “in ... turn” until there is no water left. To the court, natural wants are those of absolute
necessity to exist and: “In a civilized life, water for cattle is also necessary.” Evans v.
Merriweather 495. By “in . . . turn”, the court apparently meant that upstream location controls.
Artificial wants are those that merely supply comfort and prosperity. The court did not examine
what the mills produced but said simply that “man . . . could live if water was not employed in
irrigating lands, or in propelling machinery.” Evans v. Merriweather 495. So in Merriweather’s
case both parties were satisfying artificial wants.

The court could have decided that Evans would prevail because he was upstream and had
physical control, just like the court intimated a natural want user would. Or it could have decided
that Merriweather would prevail because his use of the water came first. Or it could have
followed what it saw as the law in some other states, that the water had to be allowed to flow
naturally with only consumption for natural wants allowed. But it did none of these. Instead it
decided that each riparian landowner has a right to make a reasonable use of the water and
“neither has a right to use all the water.” Evans v. Merriweather 496. This means that each
riparian’s right is subject to the right of every other riparian owner to also make a reasonable use.
So you cannot just look at reasonable use in the abstract, you have to look at it in the context of
that particular body of water. The court says that, in general, it is up to a jury to decide whether
“under all of the circumstances” the party complained of has used “more than his just
proportion.” Evans v. Merriweather 496. So this is how in 1842 the riparian rights doctrine of
reasonable use came into being in Illinois – in the context of a dispute between two steam mill
owners. The mills are gone from along the rivers in Illinois, but the rule remains.

In 1903, the Illinois Supreme Court made it clear that the right to reasonable use extended
to the quality of the water as well as to quantity, when it affirmed the lower court’s injunction
prohibiting the City of Kewanee in Henry County from polluting a small stream. The City was
discharging sewage into the stream, and the riparian owner was unable to use the riparian land for
pasturage as the animals would be injured by the polluted water. City of Kewanee v. Otley
(1903).

Turning then to public rights in surface waters; there are two common law foundation
cases from the Illinois Supreme Court. The first of these was also decided in 1842.

1842 – “Public” Rights versus “Private” Use

Around 1840 or 1841 Pritchard and Hafford cut trees on an island in the Mississippi
River, in Madison County, land that Middleton, the shoreland owner, claimed as his. So
Middleton sued for damages. Under federal doctrine, when a territory became a state, the new
state succeeded to the ownership of the beds underlying navigable waters, but as of 1842, the U.S.
Supreme Court had made no clear decision what navigable meant in this context. The Illinois
Supreme Court noted that in England only water subject to the ebb and flow of the tide was
deemed navigable in law, despite many fresh waters being recognized as navigable in fact.
Middleton v. Pritchard (1842). The court also noted that while some states had applied the bed
ownership doctrine to their navigable in fact watercourses, other states had declined to do so. The
court said that because Illinois had adopted the common law, the court was bound to follow it and
ruled that the island, as a part of the bed, belonged to Middleton the shoreland owner and not to
the State of Illinois. The Mississippi River was not subject to the ebb and flow of any tide, and,
therefore, it was not navigable in law. However, at the same time the court did say that if the
stream is navigable in fact, the public have a right to navigate in that water and the shoreland
owner takes the bed ownership subject to the “public easement of navigation,” which includes
“the right to land, and fasten to the shore, as the exigencies of the navigation may require.”
Middleton v. Pritchard 521-22. But the bed owner has the exclusive right to fish above the owned
portion of the bed.

Thirty years later, in 1872, the Illinois Supreme Court acknowledged that the U.S.
Supreme Court had now adopted the navigable in fact definition for purposes of bed ownership,
but said it was too late for Illinois to go back on its earlier decision. Braxon v. Bressler (1872). Thus the Rock River, in Whiteside County, was held to be not navigable in law. However, in a series of decisions from 1860 to 1896, the Court resisted extending private ownership to all beds of lakes, primarily by finding shore boundaries for the tracts from the language used in the conveyances. Seaman v. Smith (1860); Trustees of Schools v. Schroll (1887); Fuller v. Shedd (1896). These cases involved respectively Lake Michigan, Meredosia Lake, and Wolf Lake. Finally in 1896, in the Wolf Lake case, the court said: “the state exercises control, and holds the same [that is, waters and beds of navigable in fact lakes which the court has held to include all meandered lakes] in trust for all the people who alike have benefit thereof, in fishing, boating, and the like.” Fuller v. Shedd 493. This sounds like the public trust doctrine that the United States Supreme Court had applied in 1892 in an Illinois case involving the transfer of a portion of the bed of Lake Michigan to the Illinois Central railroad. Illinois Central Railroad Co. v. State of Illinois (1892). There the U.S. Supreme Court stated the doctrine as: “It [bed ownership] is a title held in trust for the people of the state, that they may enjoy the navigation of the waters, carry on commerce over them, and have liberty of fishing therein, freed from the obstruction or interference of private parties.” Illinois Central Railroad Co. v. State of Illinois 452. In 1911, the Illinois Supreme Court clarified the Illinois law relating to beds of lakes and ponds concluding that despite some broader language in earlier opinions, ownership is in the state only where the lake or pond is navigable in fact or where the lake or pond has been meandered by the federal surveyor. Wilton v. Van Hessen (1911). In 1937 the General Assembly passed an act which provided that the State was reclaiming title to both existing submerged lands and formerly submerged lands that had been illegally filled in. Submerged Lands Act (1937).

Anyway, having decided the public right to navigate in navigable in fact waters in 1842, not until almost 30 years later, in 1870, did the Illinois Supreme Court decide what constitutes navigability in fact for purposes of this public right. Bell owned and operated a saw mill on the banks of the Cache River in Union County. Bell acquired trees and logs from land located above Hubbard’s property on Big Creek, a tributary of the Cache, and then floated the logs down the creek past Hubbard’s property and on down the Cache to his, Bell’s, mill. Hubbard started cutting his own trees so they fell into the creek and cut off Bell’s opportunity to float his logs past Hubbard’s property. Bell sued Hubbard to stop this interference. Hubbard v. Bell (1870). The court concluded that for a body of water to be navigable in fact, that body had to be “generally and commonly useful to any purpose of trade or agriculture.” Hubbard v. Bell 119. The court concluded that Big Creek was capable of floating logs only in the spring (“in times of freshets of melting snows”) and there was no evidence of general use of the creek for log floating. So Bell lost. Big Creek was not navigable in fact.

In 1905, the court concluded that the public right to navigate does not include a right to hunt or fish. Schulte v. Warren (1905). Because the case involved only hunting, it can be argued that the inclusion of fishing is dictum and therefore not binding on a future court. A clear distinction could be made between hunting and fishing if the court chose to do so because the public trust doctrine as it relates to the water resource clearly includes fishing but says nothing to include hunting as seen in the quotation above from the U.S. Supreme Court. And in Fuller v. Shedd also discussed above, the Illinois Supreme Court recognized the right to “fishing, boating, and the like” as far as lakes are concerned. However, in Schulte v. Warren, the court appears to require bed ownership, although in Fuller v. Shedd, the court referred to “waters and bed” and said the doctrine is applicable to meandered streams and rivers as well as lakes.

So on to the second public rights foundation case. It was decided in 1884.

1884 – Public Rights

In 1836 a dam had been built across the Fox River in Kendall County. In 1842 Michael Parker had acquired the land on which the dam is located from the government. Since 1871,
William Parker had owned the land and facilities. In 1879, the General Assembly passed a statute providing that any person owning a dam or other obstruction across any “rivers, creeks, streams, ponds, lakes, sloughs, bayous, or other water-courses” has a duty “to place therein suitable fishways, in order that the free passage of fish up or down or through such waters may not be obstructed” with an up to $200 a year fine for failing to do so. Act to Amend Act to Secure the Free Passage of Fish in all the Waters of this State (1879). William Parker refused to provide a fishway saying it would cost $600 to do so. He was prosecuted and he lost. Parker v. The People of the State of Illinois (1884).

In upholding the statute and the judgment against Parker, the Illinois Supreme Court said that while a riparian owner has the right to take fish when over the riparian’s soil, “the fish being the common property of the people, such owner has never had the right to obstruct their passage from that portion of the river which flows over his land, nor has he the right to wantonly destroy the fish passing over it, and thus deprive the community of their right to and ownership in the fish,—hence the manner in which, the time when, and the amount such riparian shall take, for the preservation of the common property, is a legislative and governmental function.” Parker v. The People of the State of Illinois 589. If a riparian land owner may not interfere with the passage of fish without authorization from the state, there is no reason to believe that a riparian landowner may interfere with fish habitat period, absent authorization from the state.

So by 1911 it is that the public have two general rights in the waters of Illinois. First, they have the right to navigate in the navigable in fact waters. Second, they have an interest in common in the fish found in any Illinois waters. In 1911, the Illinois General Assembly created a Rivers and Lakes Commission to classify the waters in Illinois and to protect public rights in the waters.

1911 – Rivers and Lakes Commission

In 1911, then, the General Assembly passed a statute creating a Rivers and Lakes Commission to which it gave a number of tasks. Act Creating a Rivers and Lakes Commission (1911). Two tasks were primary. First the Commission was to identify and classify all the waters in Illinois, preparing a list by counties “showing both navigable and non-navigable” waters, collecting data about the waters, and sharing that data with the public. Act Creating a Rivers and Lakes Commission § 5. Second, the Commission was to have “general supervision of every body of water within the State of Illinois, wherein the State or the People of the State have any rights or interests, whether the same be lakes or rivers, and at all times to exercise a vigilant care to see that none of said bodies of water are encroached upon, or wrongfully seized or used by any private interests in any way … .” Act Creating a Rivers and Lakes Commission § 7.

This law has been amended over the years and is now administered by the Department of Natural Resources. However, its fundamental purpose, to protect the public rights in the waters of Illinois, remains.

The foregoing portion of the paper sets out the foundational law for dealing with surface waters located in streams and lakes, as contrasted with diffused surface waters such as rain and snowmelt runoff which are usually covered by the law of drainage. This paper does not explore the law of drainage; however, Professor Uchtmann explores the law of drainage in his paper.

Because generally surface waters and groundwaters are interconnected, it is necessary to explore the foundational history for groundwater law in Illinois as well.

GROUNDWATER

In 1848 Deweese began ditching water from a “wet and springy” area on his land to a grist mill he had erected. Later he conveyed the land with the grist mill and ditch to Green while
retaining the rest of the land. Ultimately the mill came to Haeger. In 1896, Edwards, the successor in ownership to the rest of the Deweese land dug a well near the mill tract and began using the water for a dairy operation. Haeger contended that Edward’s well intercepted water that would otherwise reach the wet and springy area Haeger was using for his mill supply, so Haeger began interfering with Edward’s use of the water. Edwards sought an injunction from the courts. In an 1899 opinion, the Illinois Supreme Court decided that the lower court was wrong in throwing out Edward’s request for an injunction. Edwards v. Haeger (1899). The court said that water percolating through the ground “is part of the land itself, and belongs absolutely to the owner of the land” and thus the land owner can interrupt the flow even though the interruption interferes with springs or wells on neighboring land. Edwards v. Haeger 106. The court said nothing about natural or artificial wants, nothing about reasonable use, and nothing about just proportion, all of the things it had considered in the surface water cases. While it did recognize the possible connection between surface water and groundwater, that connection was not a basis for the decision. Courts in other states had concluded that landowners could not act with malice in withdrawing groundwater nor could they waste water. Where the facts would have warranted it, would the Illinois court have applied the no malice limitation or the no waste limitation? We do not, and apparently will not, know. Nothing much happened in the courts. An Illinois appellate court criticized the absolute ownership rule in 1959. Behrens v. Scharringhausen (1959). But then in 1981 the Appellate court declined to abandon the rule and specifically refused to adopt the reasonable use rule for groundwater. Lee v. City of Pontiac (1981).

In 1983, the Illinois General Assembly passed the Water Use Act, in which they provided that “[t]he rule of ‘reasonable use’ shall apply to groundwater withdrawals in the State.” Water Use Act (1983), § 6. In 1987, the Illinois Appellate court concluded that the intention of the General Assembly was to apply the same body of common law to groundwater that applies to surface water. Bridgman v. Sanitary District (1987). So that is how, apparently, in Illinois the surface water and groundwater bodies of disparate law came together as one.

Having covered the three basic categories of water for which the law developed rules, it is necessary next to discuss the basic role of the federal government in relation to waters within Illinois. This is necessary because to the extent that the federal government is acting within its constitutional authority, it represents the supreme law of the land and any inconsistency in Illinois law must yield. U.S. Const. art. VI.

**FEDERAL LAW TRUMPS STATE LAW**

Historically, the constitutional power most frequently relied on by the federal government in acting with reference to the water resource has been the power to regulate interstate commerce. U.S. Const. art. I, § 8. Obviously in the late 1700s and early 1800s most of our commerce took place by river transport, in other words by navigation.

The U.S. Army Corps of Engineers was founded in 1802. Act Fixing the Military Peace Establishment of the United States (1802). Since then the Corps has had an ever increasing role to play as to the water resource. The Corps has both the authority to improve the navigability of waters that are navigable in fact for interstate commerce and the power to veto state and private activity that it determines would be detrimental to the navigability of those waters. The Rivers and Harbors Act of 1899 (1899). When a lower federal court enjoined the Sanitary District of Chicago from withdrawing more than 250,000 cubic feet per minute of water from Lake Michigan, the United States Supreme Court affirmed on January 5, 1925, because that was all that the Secretary of War, the then head of the Corps, had given the District permission to withdraw. Sanitary District of Chicago v. United States (1925). In 1919, the Illinois General Assembly had passed legislation to authorize the construction and development of the Illinois waterway. Act in Relation to the Construction, Operation and Maintenance of a Deep Waterway from the Water
Power Plant of the Sanitary District of Chicago at or near Lockport to a Point in the Illinois River at or near Utica, and for the Development and Utilization of the Water Power thereof (1919). In 1923, the state filed a petition in county court to condemn a tract of land for the waterway project. On February 17, 1925, the Illinois Supreme Court affirmed the lower court’s dismissal of the petition because the State did not have the consent of the federal government. Department of Public Works and Buildings v. Engel (1925). In 1929 the General Assembly enacted legislation directing cooperation with federal agencies “for the regulation and maintenance of the levels of Lake Michigan and the Great Lakes.” Act Vesting Authority in the Department of Purchases and Construction (1929).

When the Corps simply gives its consent, that is, declines to veto a project, it does not mean the project can go forward, state law would apply and might require approval. In 1919 the Wakonda drainage and levee district was formed in Fulton County. It failed to get consent for its drainage and levee plans from either the state or federal agencies although these agencies indicated that they would have approved modified plans. However, because carrying out the modified plans would have cost substantially more than carrying out the district’s plans, a petition to dissolve the district was approved by the lower court. Duck Island Hunting & Fishing Club v. Edward Gillen Dock, Dredge & Construction Co. (1928). In 1928, in affirming the dissolution, the Illinois Supreme Court noted: “As it requires in this case both the consent and authority of the state and the federal governments to construct and place an obstruction in the Illinois river, we must hold that such right and power have not been obtained by appellant, and will not be obtained until consent and authority are obtained from both the state and federal governments.” Duck Island Hunting & Fishing Club v. Edward Gillen Dock, Dredge & Construction Co. 131-32.

The Corps authority extends to nonnavigable tributaries of navigable in fact waters because obviously if every nonnavigable tributary could be blocked off or drained dry that could greatly impact navigability on the main stem. Furthermore, floating trash and trash that has settled to the bottom can affect navigation as can flooding of the stream. Rivers and Harbors Act of 1899. Flood Control Act of 1936 (1936). Thus Corps jurisdiction is broad as to the water resource. However, other federal agencies also have considerable authority over water resources. Consider just the following historic pieces of federal legislation: Reclamation Act of 1902; Federal Water Power Act of 1920 (1920); Oil Pollution Act of June 7, 1924 (1924); Federal Water Pollution Control Act of 1948 (1948).

A second very important federal power over water is the power to allocate interstate waters. The U.S. Constitution extends federal judicial power “to Controversies between two or more States.” U.S. Const. art. III, § 2. In 1789 Congress gave the U.S. Supreme Court original and exclusive jurisdiction over law suits between states. Act to Establish the Judicial Courts of the United States (1789), § 13. When Kansas sued Colorado in 1901 to have the waters of the Arkansas River allocated, the Supreme Court accepted jurisdiction in 1902. Kansas v. Colorado (1902). Since then the court has done so in a number of cases that have resulted in the allocation among states of various interstate waters. Several Supreme Court opinions have limited the use of Lake Michigan waters. In a series of opinions beginning in 1929 and running through 1980, the U.S. Supreme Court decreed the circumstances under which Illinois may withdraw water from Lake Michigan. Wisconsin v. Illinois (1929), (1930), (1933), (1967), (1979), (1980). The primary opinion was issued in 1967. With amendments over the years, the Act Vesting Authority in the Department of Purchases and Construction noted above has been designed to facilitate carrying out the Supreme Court’s 1967 decree. Level of Lake Michigan Act (2009). The legislation was upheld by the Illinois Supreme Court in 1979. Village of Riverwoods v. Department of Transportation (1979). The U.S. Supreme Court, however, has stated its preference for the states themselves to allocate interstate waters through the formulation of interstate compacts, which under the constitution require congressional consent. Such a compact was negotiated recently among the Great Lakes States, and it was approved by Congress in October of 2008. Great Lakes—St. Lawrence River Basin Compact (2008). However, the Compact expressly provides
that “current, New or Increased Withdrawals, Consumptive Uses and Diversions of Basin Water by the State of Illinois shall be governed by the terms of the United States Supreme Court in Wisconsin et al. v. Illinois et al. and shall not be subject to the terms of this Compact nor any rules or regulations promulgated pursuant to this Compact.” Great Lakes—St. Lawrence River Basin Compact § 4.14. A proposal for diversion outside of Illinois would however be covered by the terms of the compact. Great Lakes—St. Lawrence River Basin Compact § 4.14(5). The U.S. Supreme Court also has recognized that Congress has the power to allocate interstate waters and thereby foreclose the Court from doing so. Arizona v. California (1963).

Numerous water projects have been constructed under the auspices of the federal government, and different agencies of the federal government may be managing those projects. Thus the Corp of Engineers is the overall manager of Rend Lake and surrounding public lands, and the U.S. Fish and Wildlife Service manages the Crab Orchard National Wildlife Refuge. The Natural Resources Conservation Service has significant responsibility for small dams and reservoirs. To determine the scope of any federal agency’s operational authority, it is necessary to examine congressional documents authorizing the projects involved. In 1988, for example, the U.S. Supreme Court ruled that despite permission from the State of South Dakota and from the U.S. Department of the Interior, the ETSI Pipeline Project did not have the proper authorization to withdraw water from the Oahe Reservoir to use for creating coal slurry for transport via a pipeline. ETSI Pipeline Project v. Missouri (1988). The Court concluded that the permission had to come from the U.S. Army Corps of Engineers. However in 2009, the federal district court in charge of the litigation over the use of three rivers in the southeast ruled that the Corps of Engineers did not have authority to allocate water from the Lake Lanier reservoir to the City of Atlanta that it had been allocating from that Reservoir to Atlanta for several years. In re Tri-State Water Rights Litigation (2009).

QUESTIONS FROM THE AUDIENCE

One question from the audience raised the issue of the origination of the Chicago Sanitary and Ship Canal. A second question asked whether Illinois should enact a general water resource management statute. Some material relevant to those two questions has been added to the discussions above; further material is presented in this section. Hopefully these additions will provide anyone seeking to pursue the issues further easier access to relevant material.

Chicago Sanitary and Ship Canal

Before there was a Chicago Sanitary and Ship Canal there was the Illinois and Michigan Canal. On March 30, 1822, Congress authorized Illinois to proceed with the canal. Act to Authorize the State of Illinois to Open a Canal through the Public Lands, to Connect the Illinois River with Lake Michigan (1822). On February 14, 1823, the Illinois General Assembly passed legislation that would authorize the Illinois and Michigan Canal. Act to Provide for the Improvement of the Internal Navigation of this State (1823). The Act did so by appointing commissioners “to consider, devise, and adopt such measures as shall or may be requisite to effect the communication, by canal and locks, between the navigable waters of the Illinois River, and Lake Michigan....” Act to Provide for the Improvement of the Internal Navigation of this State § 1. On January 17, 1825, the General Assembly passed an act incorporating a company to carry out the project. Act to Incorporate the Illinois and Michigan Canal Company (1825). On January 20, 1826, the General Assembly repealed both of these statutes so that the state could direct the construction of the canal. An Act to repeal an Act to incorporate the Illinois and Michigan Canal Company, and for other purposes (1826), § 1. The General Assembly then memorialized Congress requesting donation of land along the route of the canal, complaining that
the company had not been able to do anything because the area was too remote. Memorial to Congress on the Subject of the Illinois and Michigan Canal (1826). On March 2, 1827, Congress responded with a grant of land to Illinois. Act to grant a quantity of land to the state of Illinois, for the purpose of aiding in opening a canal to connect the waters of the Illinois river with those of Lake Michigan (1827). The canal, which stretched from the Chicago River to LaSalle-Peru, opened in 1848.

After industrialization in Chicago, many industries were dumping refuse into the Chicago River. However, at this point the flow of the Chicago River had not been reversed so it was still basically flowing into Lake Michigan. In 1889 the Illinois General Assembly authorized the creation of Sanitary Districts. Act to Create Sanitary Districts, and to Remove Obstructions in the Des Plaines and Illinois Rivers (1889). This Act contemplated construction of the Chicago Sanitary and Ship Canal. Act to Create Sanitary Districts, and to Remove Obstructions in the Des Plaines and Illinois Rivers §§ 23 & 24. The Sanitary and Ship Canal opened in 1900. Vette v. Sanitary District of Chicago (1913); Brockschmidt v. Sanitary District of Chicago (1913). The canal stretched from the south branch of the Chicago River to the Des Plaines River.

**General Water Resource Management Statute**

There could be two main advantages from the adoption of a comprehensive water resource management statute in Illinois. First, a comprehensive water resource management statute would most likely consolidate Illinois water law now located in disparate statutes and court opinions into one body. Second, a comprehensive water resource management statute would most likely allow determination of whether a use of water would constitute a reasonable use of the water in advance of commencing development of that water use rather than by a jury after the use has commenced. A third possible benefit could be from filling gaps in the existing law.

Currently 18 of the 30 states that follow riparian doctrine for use of surface water have enacted water resource management statutes that are comprehensive enough to have been labeled as constituting regulated riparianism. Dellapenna (2007). Thus Illinois would not have to act without having the experience of other states to review. One such considerable review has already taken place under the auspices of the American Society of Civil Engineers, through their Water Laws Committee, with the creation of the Regulated Riparian Model Water Code published in 1997. Regulated Riparian Model Water Code (1997). Thus Illinois would have the benefit of working with a document that has been drafted to represent the best of the statutes in existence in other states.

**REFERENCES**

Act of March 16, 1802, ch. 9, §§ 26-28, 2 Stat. 132, 137.
Act in Relation to the Construction, Operation and Maintenance of a Deep Waterway from the water power plant of the Sanitary District of Chicago at or near Lockport to a point in the Illinois river at or near Utica, and for the development and utilization of the water power thereof, 1919 Ill. Sess. Laws 978.
Act Regulating Grist Mills and Millers, March 25, 1819.
Act Regulating Mills and Millers, June 1, 1827.
Act to Amend Act to Secure the Free Passage of Fish in all the Waters of this State, 1879 Ill. Sess. Laws 171.
Act to Authorize the State of Illinois to Open a Canal through the Public Lands, to Connect the Illinois River with Lake Michigan. 3 Stat. 659 (1822).
Act to Establish the Judicial Courts of the United States, Ch. XX, 1 Stat. 73 (1789).
Act to grant a quantity of land to the state of Illinois, for the purpose of aiding in opening a canal to connect the waters of the Illinois river with those of Lake Michigan, 4 Stat. 234 (1827).
Act to Provide for the Improvement of the Internal Navigation of this State, 1823 Ill. Sess. Laws 151.
Act to repeal an Act to incorporate the Illinois and Michigan Canal Company, and for other purposes, 1826 Ill. Sess. Laws 63.
Braxon v. Bressler, 64 Ill. 488 (1872).
City of Kewance v. Otley, 204 Ill. 402 (1903).
Department of Public Works and Buildings v. Engel, 315 Ill. 577 (1925).
Evans v. Merriweather, 4 Ill. 492 (1842).
Fuller v. Shedl, 161 Ill. 462 (1896).
Hubbard v. Bell, 54 Ill. 110 (1870).
Level of Lake Michigan Act, codified at 615 ILCS 50/1 to 50/14 (2009).
Middleton v. Pritchard, 4 Ill. 510 (1842).
Oil Pollution Act of June 7, 1924, 43 Stat. 605 Ch. 316.
Parker v. The People of the State of Illinois, 111 Ill. 581 (1884).
Seaman v. Smith, 24 Ill. 521 (1860).
Trustees of Schools v. Schroll, 120 Ill. 509 (1887).
U.S. Const. art. I, sect. 8.
U.S. Const. art. III, sect. 2.
U.S. Const. art. VI.
Wilton v. Van Hessen, 249 Ill. 182 (1911).
IL Agriculture & Water Law

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12th Governor’s Biennial Illinois River Conference
Peoria, Illinois
Three general ag issues …

1. Getting rid of excess water (drainage law)
2. Landowners’ rights to dig wells and pump ground water for agricultural uses
3. Riparian landowners’ rights to withdraw water from a stream

So … lets look at each of these in turn and then do some reflecting
IL Drainage Law Overview

- **Local** Ordinances are important, e.g., Storm-water Detention/Management Ordinances
- **State** laws are important, especially Court Decisions the Illinois Drainage Code
- **Federal** laws are important, *e.g.*
  - Wetlands provisions of ‘85 Farm Bill: Tie wetlands protection to Ag Program Benefits
  - Clean Water Act: Drainage improvements may require a Section 404 Permit from Army Corps of Engineers
State Drainage Law

Civil Law Rule (Landowners entitled to natural drainage) plus “Good Husbandry” Rule

- Higher landowner entitled to natural drainage and can improve drainage in the interests of good husbandry
  - e.g. drain or fill ponds
  - e.g. accelerate flow by tiling or ditching in course of natural drainage
- See Peck v. Herrington (IL Sup Ct, 1884)
- But there are limitations . . .
Limitations on Ag Drainage Improvements

- Can *not* bring water in from another watershed
- *Must* discharge at point where water naturally enters lower land

Possibility of Other Limitations:
- Local Ordinances, e.g., storm-water detention
- Federal Laws, e.g., wetlands protection
Non-Ag Development

• No water from another watershed (same)
• No discharge unless at natural drainage point(same)
• No unreasonable increase in flows (New twist)
  • *Templeton v. Huss* (IL Sup Ct, 1974)
• But also remember . . .
  • Federal Wetlands Protections may apply, e.g., a permit from the Corps may be required
  • Local Ordinances may apply, e.g., storm-water detention requirements
2009 IL Supreme Court Case
Halpin v. Schultz (IL Sup Ct, 2009)

- **Key facts:**
  - Grundy County dispute involving repairs to drainage tile
  - Upper landowner needed to enter lower owner’s land to make repairs to drainage tile running from higher land across lower land

- **IL Supreme Court confirmed the following principles:**
  - Upper landowner can enter lower land to repair tile
  - Lower landowner entitled to
    - Damages caused by negligence, if this is a “mutual drain”
    - All damages, if this is an “extension” of upper landowner’s drain
Drainage Law Summary

- Local, State and Federal laws are important
- Basic State Law of Drainage: Civil Law Rule
  - Additional rights to improve natural drainage
  - Limitations on drainage improvements
- Statutory Enlargements:
  - Extending Covered Drain; Mutual Drains
    - 2009 IL Supreme Court Case: Halpin v. Schultz
- Drainage Districts can be created (Drainage Code)
- Federal Environmental Considerations
  - Swampbuster provisions of the Food Security Act
  - Section 404 of the Clean Water Act
IL Water Use Law (Groundwater)

- **Doctrine of Reasonable Use**
  - IL Water Use Act of 1983
  - Landowners (e.g., farmers) can withdraw ... a fair share for artificial needs (e.g., irrigating crops, watering commercial livestock)
  - If planning a new well pumping > 100,000 Gal/Day, must notify SWCD
    - SWCD shares info but has no real power
- **IL Courts** resolve “fair share” disputes
- **Water Authority**
  - Has more regulatory power, but ... 
  - Little of IL within boundaries of Water Auth.
**Riparian Doctrine – Reasonable Use Rule**
- Fashioned by courts over centuries
- Riparian owners (e.g., farmers next to stream) can make … reasonable use of stream for artificial uses
  - Irrigating crops
  - Watering commercial livestock

**Courts resolve “what is reasonable use” disputes**
Implications for Agriculture

- Accessing water for irrigation, commercial livestock
  - Few legal hurdles before farmer can access water
  - But the same is true for any landowner
- Future planning by farmers, other water users
  - Planning for and investing in operations requiring large volumes of water is problematic
  - Hard to know what your “fair share” is, up front
  - As others also tap into your water source, your “fair share”, whatever it was initially, is likely to decline
  - Since nobody is managing the whole water resource, your source of water may become depleted
Ag Implications (Cont’d)

- IL has historically been a water surplus state
  - Generally, enough water to go around, for ag and others
  - Disputes over water use have been relatively rare
- But the future may be more problematic
  - Need for water continues to increase
    - Growing population
    - New uses, e.g., ethanol plants, recreation
    - Recognition of ecological value of minimum stream flows
  - Uncertainty re effects of climate change on rainfall
The Big Question

Should IL Water Law further evolve, e.g., by

- Recognizing the connectedness between diffused surface water, stream water, and groundwater;
- Providing greater guidance regarding the rights of competing water users and uses; and
- Creating other tools to manage this increasingly scarce resource in ways that are sustainable?
Thank you!

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The focus here will be on the federal Clean Water Act and what it does and fails to do to prevent pollution in the Illinois River, its tributaries and the downstream waters it affects.

A. THE SOURCES OF WATER POLLUTION

To understand the problem, it is necessary to review the kinds of pollution entering the Illinois River both directly and through its tributaries. According to public reports available from Illinois EPA and other sources, most of the impairments to the Illinois River and its tributaries are caused by mud (sediment), phosphorus, and habitat loss. Although their effects are less well known, we should probably also consider “emerging pollutants” that include endocrine disrupting chemicals, personal and pharmaceutical products and other forms of pollution that have been shown to be entering our waters in detectible concentrations with uncertain effects. If we look downstream, the science is clear that the Illinois River is a major source of the nitrogen pollution causing the Gulf of Mexico “Dead Zone.”

How these pollutants reach the Illinois River and its tributaries is not a mystery. Sediment comes from agriculture and development. Phosphorus and nitrogen come from agriculture, sewage treatment plants, some industries and storm runoff from lawns, golf courses and other places. Habitat loss comes from agricultural ditching and draining of Illinois waters as well as development. Agriculture, along with sewage treatment plants and urban runoff, is also a major source of the emerging pollutants such as the herbicide atrazine and other chemicals used in crop and livestock agriculture.

Looking specifically at nitrogen and phosphorus pollution, a recent government report states that crops contribute 43% of the phosphorus and 66% of the nitrogen to the Gulf of Mexico, while livestock contributes 37% of the phosphorus and 5% of the nitrogen. A study directly focused on

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4 See note 1
nitrogen and phosphorus pollution from Illinois sources concluded that nitrogen pollution mainly originated with agricultural fertilizer and that agriculture was the source of about half of the phosphorus entering the Illinois River.7

In sum, agriculture is a big part of the problem. What is even worse is that agriculture is largely “above the law” when it comes to water pollution.

B. CLEAN WATER ACT

The Clean Water Act (“CWA”), 33 U.S.C. § 1251 et seq. was enacted by Congress in 1972 as an amendment to the Federal Water Pollution Control Act over President Nixon’s Veto.8 The CWA has been “spectacularly successful, dramatically reducing the discharge of raw sewage into our lakes rivers, and streams.”9

The CWA applies to all “waters of the U.S,” the exact meaning of which has become a very hot topic of late given recent Supreme Court decisions that have weakened protection by the CWA of many wetlands and certain ephemeral and intermittent streams.10 Under the CWA, the waters of the United States were to be “fishable and swimmable” by July 1, 1983. 33 U.S.C. §1251(a)(2).

A critical point here is that the CWA divides pollution into point and non-point sources. Point source pollution, also referred to as a “discharge of pollutants,” is defined as “any discernible, confined and discreet conveyance” §502 (14) such as a pipe coming from a factory or sewage treatment plant. Point sources are controlled by the National Pollution Discharge Elimination System (NPDES). One must have a NPDES permit to discharge from a point source. 33 U.S.C. §1311(a). The goal of the CWA (§101(a)(1)) was to eliminate discharges by 1985. “One of the primary objectives of the Act, as stated in section 101, 33 U.S.C. § 1251(a)(1), is to achieve the national goal ‘that the discharge of pollutants into navigable waters be eliminated by 1985.’” In re Ocoee River Dam No. 2 Hydroelectric Project, 717 F.2d 992, 998 (6th Cir. 1983).

Some people have referred to the approach taken by the CWA to point source pollution as “command and control.”11 The police-state rigor suggested by this phrase is laughable to anyone actually familiar with CWA enforcement, which has been anything but firm.12 In various ways, Congress, the courts and the Illinois legislature seem to have competed to make the statute as unenforceable as possible through such means as burdensome notice requirements,13 legal interpretations that handcuff citizen enforcement14 and statutes that require the Illinois Environmental Protection Agency to go through a long hand-holding process with the violator before it is allowed to refer most cases for prosecution.15 The combined effect of such provisions is to make it profitable in many cases to violate the law until one is caught and then stall on

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13 CWA Section 505(b), 33 U.S.C. §1365(b).
15 415 ILCS 5/31(d)
compliance as long as possible.

Nonetheless, much progress has been made on point source pollution since 1972. Mandatory controls on pollution work even though many regulated polluters are allowed to go on polluting without adequate controls for years. Indeed, because so much progress has been made on point source pollution, it has become a theme of many point sources that it is time for environmentalists to leave them alone and deal with non-point pollution.16

These claims to innocence by regulated point sources are somewhat exaggerated (as will be discussed below), but the fact remains that to a substantial extent the law has been unwise as a matter of economics (and perhaps fairness) in focusing entirely on point source pollution.

C. NON-POINT WATER POLLUTION

Non-point pollution is basically unregulated by the Clean Water Act. Non-point sources include run-off from agriculture and construction sites in rural areas less than one acre in size.

Under the CWA, many sources of agricultural pollution are not considered point sources. The key section in the CWA on this point states:

(14) The term “point source” means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture. Clean Water Act Section 502(14) (33 U.S.C. §1362(14))

(16) See Report of the State-EPA Nutrient Innovations Task Group, supra note 6 at 33

Thus, although field tile drains and many other sources of agricultural water pollution may look like point source pollution, and flow like point source pollution and cause as much environmental damage as point sources, they are not point sources. Because by Congressional definition tile drains are not point sources, pollutants from tile drains are not discharges and are not regulated by the National Pollutant Discharge Elimination System.

D. MUCH PROGRESS COULD BE MADE BY BETTER IMPLEMENTING THE CWA

Before further bemoaning the shortcomings of the CWA, it is important to state that much more progress could be made to prevent pollution in the Illinois River system and the waters below it by better enforcing the current law.

First, traditional point sources like municipal sewage and factories could be regulated better.

For example, point sources are the biggest part of the phosphorus pollution problem in many waters. University of Illinois scientists Mark David and Lowell Gentry have estimated that “47%
of the total P [phosphorus] loads in Illinois rivers were from sewerage for 1980 through 1997.\textsuperscript{17}

There is also reason to believe that point source discharges of phosphorus are actually more harmful to the environment than other phosphorus loadings. As stated in the Minnesota Pollution Control Agency Detailed Assessment of Phosphorus Sources to Minnesota Watersheds, “Phosphorus from point sources may be more bio-available, impacting surface water quality more than a similar amount of non-point source phosphorus that enters the same surface water.”\textsuperscript{18}

Point sources are also probably the biggest source for pharmaceutical products and other pollutants that now go through the plants without being fully treated.\textsuperscript{19} Regarding pathogen pollution, the Metropolitan Water Reclamation District of Greater Chicago still does not disinfect most of the effluent it discharges into the Chicago River waterway system and over 100,000 private discharging systems are illegally pouring essentially untreated sewage into rivers, streams and backyards across the state.\textsuperscript{20}

Further, some pollution sources widely assumed to be non-point sources are actually point sources under the law. Stormwater from construction and industrial sites in urban areas is generally considered a point source and is regulated under the NPDES system.\textsuperscript{21}

E. WHAT THE CLEAN WATER ACT DOES REGARDING POLLUTION FROM AGRICULTURE: NOT ENOUGH

Even though agricultural stormwater pollution is broadly exempted from the CWA, not all agricultural pollution stands outside the law.

Very large animal feeding operations (AFOs) are treated as point sources. See 40 CFR 122.24. The ones that are so treated are called Concentrated Animal Feeding Operations (CAFOs). Unfortunately, CAFO pollution from animal manure can escape regulation as point source pollution if it is first spread on a farm field. Under current law, this process magically converts manure to agricultural stormwater pollution, even if the phosphorus, pathogens, antibiotics and other pollutants in the manure later reach the water. Waterkeeper Alliance v. EPA, 399 F.3d 486 (2d Cir. 2005).

Pesticides dropped directly in the water, as opposed to being sprayed on a field and later washing into the water, can also be point source pollution. Direct spraying of pesticides into water, even if unintended, is a dry weather discharge but general permits will probably be established that will render this unimportant. National Cotton Council v. EPA (6th Cir. 2009). Other dry weather

\textsuperscript{17} David, M.B and Gentry L.E. supra note 7.
\textsuperscript{19} Mendoza, M. “Range of Pharmaceutical in Fish Across U.S.” AP 25 March 2009.
\textsuperscript{20} Voluminous documentation regarding the MWRDGC’s undisinfected discharge is contained in the Illinois Pollution Control Board record in R08-9. The IPCB is now considering whether to require MWRDGC to disinfect like almost all other sewage treatment operators in the state. The controversy regarding Illinois’ failure to regulate small discharging sewage systems has raged in the state legislature, see e.g. H.B. 172, and in debates over Illinois EPA’s tardy efforts to regulate such systems. It is clear allowing such systems to continue to go unregulated under the CWA is having a deleterious effect on Illinois waters and public health. See, Manci, K. and Vollmer, M., “Management of Individual Mechanical Sewage-Treatment Systems: How Much is Needed,” Journal of Environmental Health, Vol. 63, 2001 (67% failure rate found in Will County).
discharges should also be better regulated under the CWA. Wet application of manure to tile drains that results in a dry weather flow should be regulated as a discharge.

Placing materials into waters of the United States so as to change water bodies physically (“fills”) are regulated under Section 404 of the CWA by the Corps of Engineers unless they fall under the exception provided for “normal farming” and “maintenance” activities. 33 U.S.C. §1344(f). Thus, stream channelization projects, such as those that have wrecked streams across Illinois and caused much sedimentation, are regulated by the Corps, or at least are supposed to be.

In the late 1990s, it was thought by some that section 303(d) of the CWA, which provides for Total Maximum Daily Load (TMDL) calculations, might be used to address pollution from agriculture and some agricultural groups sought to spread terror among their members that this would happen. But even if this regulation had happened, agricultural operations would not have had much to worry about. Even the strictest TMDL plan only amounts to a polite request that agriculture operations lessen the water pollution they create. Unless there is a state law that forces reductions in non-point pollution, a TMDL cannot require anyone to do anything. Pronsolino v. Nastri, 291 F. 3d 1123, 1140 (9th Cir. 2002). Regulations proposed by EPA in 2000 under CWA Section 303(d) that were intended to put teeth in the requirement that TMDL plans provide “reasonable assurance” that water bodies would actually be restored were delayed by Congress and ultimately killed by the Bush Administration.22

CWA Section 319 requires states to develop plans for controlling non-point pollution, but does not establish mandatory controls. CWA section 319 provides grants to States to address non-point sources, but the grants are nowhere near sufficient to deal with the scope of the problem.

Finally, though the focus here is on the CWA, elements of the federal Farm Bill have certainly provided incentives to wean agricultural operations off some practices that increase pollution. Sodbuster, Swampbuster, and restrictions on using highly erodible lands are some of the most important measures that have been enacted to control water pollution although they generally have been enforced weakly and apply only to operations that receive federal payments.23

F. NEW LEGISLATION IS NEEDED TO CONTROL POLLUTION FROM AGRICULTURAL SOURCES

A person with whom I sometimes have the honor to work, Craig Cox, Vice President of the Environmental Working Group, explained eloquently the nature of the problem at the Mississippi River Gulf of Mexico Watershed Nutrient Task Force Public Meeting of September 23, 2009:

“[W]e have proven conservation practices and systems that could – if effectively applied – take us a long way toward meeting these pressing challenges. Yet after seven decades of conservation programs in the United States, critical conservation


practices and systems are still used by only a minority of farmers and ranchers. The fundamental barriers to accelerating progress are created by our politics, policies, and institutions, not by a lack of technology…

If we take concerted action to improve the effectiveness of federal and state voluntary programs, we will see more results, more quickly. But even the most focused and best-managed voluntary programs will not be sufficient to meet the challenges we face this century. Voluntary programs have inherent weaknesses including: (1) the producers who volunteer are often not the ones who can do the most to solve problems, (2) producers’ priorities dominate especially if they are picking up part of the tab, but producer priorities may be different than what needs to be done to solve pressing problems, and (3) programs are designed more to provide equal opportunity for all producers to participate than to wisely direct scarce funding to producers actually who can make the greatest contribution to solving problems. These weaknesses in voluntary programs too often result in random acts of conservation rather than highly focused acts of conservation we urgently need today (Cox 7).24

So what is to be done? One possibility, of course is to amend the Clean Water Act to now control unregulated sources of pollution. Obviously, any such step would have to take into account the unique factors relating to agricultural pollution and it would certainly be impossible to treat corn fields in the same manner that sewage treatment plants and refineries are regulated. Some, but far from all, of the regulations now applicable to urban stormwater might be applied to agricultural stormwater.

Another possible approach would be to amend the Clean Water Act to create incentives for states to develop effective programs to control non-point pollution. This approach may have more political appeal and could be fashioned using either sticks against states that failed to act or carrots to states that chose to establish effective controls on pollution from agriculture. See Pronsolino, 291 F. 3d at 1141.

With or without amendments to the CWA that create incentives for such programs, Illinois might look to the relatively small number of states that have laws that attempt to control pollution from row crops.25 States that have laws that cover some aspects of pollution from row crops include California, Oregon, Wisconsin, Delaware, Maryland, and Kentucky.26

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25 An Illinois law that has not been badly underutilized – the Rivers, Lakes and Streams Act (615 ILCS 5/4.9 et seq.), might be expanded to cover a number of practices which cause pollution or otherwise harm the “natural conditions” that are supposed to be protected by that law.

CONCLUSION

The Clean Water Act has been a very successful statute but it has taken us about as far as it can in its current form. Without amending the Act or creating other laws that effectively control what is now treated as non-point pollution by the CWA, further progress will not be made and inevitably water quality will substantially worsen as the population increases. It will not be easy or always politically popular to develop laws and programs to control non-point pollution. However, we do not have the luxury of neglecting critical tasks just because they are difficult.
A Decade of Progress Associated with Agricultural Practices
Jon Hubbert
USDA
Natural Resources Conservation Service

Success with Controlling Erosion
Alan Gulso
Illinois Department of Agriculture

Water Quality in Illinois
Paul Terrio
US Geological Survey
Agricultural Practices in the Illinois River Watershed

Jon Hubbert, Assistant State Conservationist - NE Illinois
4 chapters in 20 minutes (or less)

- Ag practices recommendations
- Success Stories (3/4 Full)
- Challenges (1/4 Empty)
- Summary
Integrated Management Plan adopted in 1997
7 Recommendations

14. Expand and revise voluntary cost share programs
15. Promote and implement cost effective efforts to treat non cropland erosion
16. Increase funding for C-Far
17. Expand voluntary farmer involvement with research teams
7 Recommendations (cont.)

18. Seek legislation to improve tax incentives for specific conservation activities

19. Expand existing programs to reach more producers with new technology

20. Investigate dedicated funding sources for soil erosion and water quality initiatives
Success Stories 1

- **Public and Private Partnerships** *(many more than those listed)*
  - AISWCD and County Soil and Water Conservation Districts
  - IDNR
  - IDoA
  - IEPA & USEPA
  - US Army Corp of Engineers
  - USDA – NRCS, FSA, RD, and Forest Service
  - US Fish and Wildlife Service
  - U of I Extension Service
  - Non Government – TNC, PF, DU, FB, Watershed Groups, and many more
Success Stories 2

- Programs
  - Working lands conservation = EQIP, CSP, WHIP, CPP, EPA-319, AWEP, FRPP
  - Reserve programs = CRP, CREP, WRP, GRP, EWP-FPE, and land acquisition
Success Stories 2a (Working Lands)

- EQIP Highlights ($12 to $17 million/yr Illinois)
  - Increased adoption of No-till, Strip Till, & Nutrient Management
  - Increased development and implementation of Comprehensive Nutrient Management Plans and Forestry Management Plans
  - Continued support for the installation of structural conservation practices

- CSP, CSP, WHIP, AWEP, CPP, EPA-319
Success Stories 2b (Reserve programs)

- CREP Highlights (126,951 acres enrolled in watershed)
  - State enrollments totaling 81,995 acres
  - Removes sensitive agricultural land from production and establishes conservation cover
  - Promotes wildlife habitat, improves water quality, reduces soil erosion, and reduces flood damage

- CRP = 1,050,746 acres statewide

- WRP = 11,480 ac. in watershed, and GRP, EWP-FPE

- TNC, IDNR, and Forest Preserve acquisitions
Success Stories 3

- People = Landowners and operators, land improvement contractors, agencies, special interest groups, and volunteers
Success Stories 4

- Practices on the land
  - Soil quality (sediment & erosion reduction)
  - Surface and ground water quality and quantity
  - Air quality
  - Plant health
  - Wildlife habitat
7 Recommendations

14. Expand and revise voluntary cost share programs
15. Promote and implement cost effective efforts to treat non cropland erosion
16. Increase funding for C-Far
17. Expand voluntary farmer involvement with research teams
7 Recommendations (cont.)

18. Seek legislation to improve tax incentives for specific conservation activities
19. Expand existing programs to reach more producers with new technology
20. Investigate dedicated funding sources for soil erosion and water quality initiatives
Challenges

- **Financial**: Stable funding for programs and staff delivering programs and providing technical expertise.

- **Technical**: Cost effective measures to address erosion in bluff areas

- **Others**: Landowner Interest
Summary

¾ full - Major progress has occurred in the implementation of conservation practices on agricultural land since 1997.

¼ empty – There is more to do and human and financial resources are stretched very thin.
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Success With Controlling Erosion

Alan Gulso
Illinois Department of Agriculture
Sources of Erosion

Agriculture
Streambank
Urban
Illinois Erosion & CRM Transect Survey

- Conducted annually 1994-2001, 02, 04, 06 & 09
- Assesses
  - Crop residue management
  - Sheet & rill erosion
  - Ephemeral & gully erosion
- Windshield survey
- Conducted by SWCD, NRCS and IDOA Staff
- Collects data after crop is planted from 500 fields per county
- Statewide over 50,000 fields
- Results targeted for planning purposes
Field Data Collected (RUSLE)

- Crop & Residue
- Rainfall Intensity
- Soil Erodibility
- Practice Factor
- Slope Factor
Conventional Tillage
0-15% Crop Residue
Reduced Tillage
15-30 % Crop Residue
Mulch Tillage
30+ % Crop Residue
No-till

30+ % Crop Residue
Cover Crop, CRP or Hayland
## Affects of Residue Cover on Erosion

<table>
<thead>
<tr>
<th>Tillage System</th>
<th>Residue Level</th>
<th>Soil Erosion (tons/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>10%</td>
<td>13.2</td>
</tr>
<tr>
<td>Reduced-till</td>
<td>20%</td>
<td>8.8</td>
</tr>
<tr>
<td>Mulch-till</td>
<td>40%</td>
<td>4.7</td>
</tr>
<tr>
<td>No-till</td>
<td>60%</td>
<td>1.9</td>
</tr>
<tr>
<td>Cover Crop</td>
<td>95%</td>
<td>0.3</td>
</tr>
</tbody>
</table>
IRW
Corn Crop Tillage Systems

- Conventional
- Reduced
- Mulch
- No-till
Soybean Crop Tillage Trends
High vs Low Residue


Low Residue
High Residue
High Residue Systems
Corn vs Soybeans

Corn
Soybeans
Reasons for Changes in Soybean Tillage System Use

1. Herbicide technology
2. No yield reduction compared to full tillage
3. Economics
4. Erosion control
Average Sheet & Rill Erosion Rates
IRW Crop Fields

Tons/Acre/Year

Ephemeral & Gully Erosion

- Would recommend a practice to control erosion due to concentrated flow
- No clear trend
- Averages 16-27%
- 2009 – 20%
Practices for Controlling Ephemeral & Gully Erosion

**Grassed Waterways**
- Reduces crop acreage
- Establishment??

**WSCOBs**
- Traps sediment
- User friendly
- Minimal land loss

**Terraces**
- Controls sheet erosion
- Long life span
# FY 07 Partners for Conservation Program

## Erosion Control Accomplishments

<table>
<thead>
<tr>
<th>Metric</th>
<th>Statewide</th>
<th>IRW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practices applied</td>
<td>1611</td>
<td>589</td>
</tr>
<tr>
<td>Total cost-share funds</td>
<td>$3.6 m</td>
<td>$1.3 m</td>
</tr>
<tr>
<td>Landowner investment</td>
<td>$2.7 m</td>
<td>$1.0 m</td>
</tr>
<tr>
<td>Soil saved (tons/year)</td>
<td>151,882</td>
<td>42,547</td>
</tr>
<tr>
<td>Semi-truck loads</td>
<td>6,903</td>
<td>1,933</td>
</tr>
<tr>
<td>Sediment load reduction</td>
<td>43,161</td>
<td>12,519</td>
</tr>
</tbody>
</table>
Streambank Erosion

- Accounts for 10-50% of sediment load
- Stabilization challenged by channel realignment & urban development
- Restoration can be expensive
- Difficult to install erosion control on contiguous segments due to landowner interest
- Limited financial assistance for cost-share & technical assistance
Changes Affecting Streambank Erosion Control

- Research & development of low-cost practices
- State & federal cost-share programs started
- Permitting process simplified
  - USACE Nationwide # 3 & 27
  - USACE Regional
  - IDNR-OWR Illinois # 9
- Technical assistance available through SWCD/NRCS
Streambank Erosion Control
Rock Riffles
Rock Riffles

Before

After
Longitudinal Stone Toe Protection

Before

After
Summary

- The amount of conventional tillage used to plant both corn and soybeans have significantly dropped since 1994.
- Mulch-till and no-till (30+% crop residue) soybeans have increased 28 percentage points since 1994.
- Corn fields planted by mulch-till showed a 14 percentage point increase while no-till dropped by 6 percentage points over the past 16 years.
- Sheet and rill erosion on agriculture land continues a downward trend with the average erosion rate being reduced by one-half ton per acre since 1994.
- Ephemeral Erosion remains constant with 20% of crop fields needing a practice to control concentrated flow runoff.
Summary

- The research and development of low-cost streambank stabilization techniques combined with a simplified permitting process has improved the adoption of streambank stabilization practices

Thank You
Water Quality in Illinois: A 2009 Perspective

Paul Terrio
U.S. Geological Survey
Illinois Water Science Center

With the assistance of many gracious volunteers!
“Water Quality” is subjective

- Point of reference or background
  Upbringing, environment, experiences

- Opinion and ideology
  Use, management, protection / restoration

- Needs and goals
  Health, recreation, uses, environmental

- Allegiance and livelihood
  Employment, politics, dependence (restrictive v. relaxed)
- **Physical**
  Aesthetics, temperature, dissolved oxygen, turbidity...

- **Chemical**
  Nutrients, ions, organic compounds, trace elements, pharmaceuticals, sediment...

- **Biological**
  Microbial, fish and bugs, algae and plants, habitat, humans and wildlife
<table>
<thead>
<tr>
<th>Designated Use</th>
<th>Miles Assessed</th>
<th>Percent Assessed</th>
<th>Percent Fully Supporting (Good)</th>
<th>Percent Not Supporting (Fair)</th>
<th>Percent Not Supporting (Poor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Life</td>
<td>15,314</td>
<td>21.5</td>
<td>61.1</td>
<td>34.8</td>
<td>4.1</td>
</tr>
<tr>
<td>Fish Consumption</td>
<td>3,827</td>
<td>5.4</td>
<td>0.0</td>
<td>91.9</td>
<td>8.1</td>
</tr>
<tr>
<td>Indigenous Aquatic Life</td>
<td>85</td>
<td>100</td>
<td>38.2</td>
<td>55.1</td>
<td>6.7</td>
</tr>
<tr>
<td>Primary Contact</td>
<td>3,915</td>
<td>5.5</td>
<td>18.9</td>
<td>36.2</td>
<td>44.9</td>
</tr>
<tr>
<td>Water Supply</td>
<td>1,108</td>
<td>100</td>
<td>9.0</td>
<td>91.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Secondary Contact</td>
<td>740</td>
<td>1</td>
<td>100</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Aesthetic Quality</td>
<td>0</td>
<td>0</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Perceived Issues

We tend to identify those issues which:

1) have a personal impact
2) have a professional implication
3) We hear about most often
Water Quality Issues – perceived

#1 **Sediment** – erosion, transport, deposition

#2 **Nutrients** – excessive algal growth, eutrophication, transport to the Mississippi and the Gulf of Mexico

#3 **Runoff** - Agricultural and Urban (Non-point)

--- Pesticides, Pharmaceuticals, Antibiotics, Pathogens
<table>
<thead>
<tr>
<th>Potential Cause of Impairment</th>
<th>Stream Miles Impaired</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fecal Coliform</td>
<td>3,175</td>
</tr>
<tr>
<td>2. Oxygen, Dissolved</td>
<td>3,079</td>
</tr>
<tr>
<td>3. Mercury</td>
<td>2,941</td>
</tr>
<tr>
<td>4. Polychlorinated biphenyls</td>
<td>2,821</td>
</tr>
<tr>
<td>5. Alteration in stream-side or littoral, vegetative cover</td>
<td>2,261</td>
</tr>
<tr>
<td>6. Sedimentation / Siltation</td>
<td>2,259</td>
</tr>
<tr>
<td>7. Phosphorus (Total)</td>
<td>2,092</td>
</tr>
<tr>
<td>8. Manganese</td>
<td>1,885</td>
</tr>
<tr>
<td>9. Total Suspended Solids</td>
<td>1,580</td>
</tr>
<tr>
<td>10. Cause Unknown</td>
<td>1,325</td>
</tr>
</tbody>
</table>
# Potential Impairment Top Ten List – Lakes

<table>
<thead>
<tr>
<th>Potential Cause of Impairment</th>
<th>Acres Impaired</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fecal Coliform</strong></td>
<td></td>
</tr>
<tr>
<td><strong>11. Oxygen, Dissolved</strong></td>
<td>12,221</td>
</tr>
<tr>
<td>4. Mercury</td>
<td>71,589</td>
</tr>
<tr>
<td>8. Polychlorinated biphenyls</td>
<td>25,817</td>
</tr>
<tr>
<td>Alteration in stream-side or littoral vegetation</td>
<td></td>
</tr>
<tr>
<td>10. Sedimentation / Siltation</td>
<td>13,925</td>
</tr>
<tr>
<td>1. Phosphorus (Total)</td>
<td>109,078</td>
</tr>
<tr>
<td>5. Manganese</td>
<td>67,185</td>
</tr>
<tr>
<td>3. Total Suspended Solids</td>
<td>105,390</td>
</tr>
<tr>
<td>9. Cause Unknown</td>
<td>17,128</td>
</tr>
<tr>
<td>2. Aquatic Algae</td>
<td>106,680</td>
</tr>
<tr>
<td>6. Atrazine</td>
<td>26,997</td>
</tr>
<tr>
<td>7. Aquatic Plants</td>
<td>26,992</td>
</tr>
</tbody>
</table>
Successes

Pipe-source reductions through WQ standards and discharge permits.

Ammonia, chloride, metals, bacteria, oxygen-demanding wastes

Construction Grants Program, State Revolving Funds

Erosion and Sedimentation reduction 43% reduction (nationally) in sheet and rill erosion (2002 NRI)

Implementation and improvement of urban and rural BMPs (sediment and nutrients)

Programs through NRCS, IDOA, IEPA, USDA, USEPA, others.
Successes (continued)

- Pesticide use reduction / improvement
  - Reformulations, Restrictions, Discontinuance
  - Genetically engineered crops

- Monitoring efforts
  - Improved capabilities and equipment
  - Increased efforts and Volunteer participation
  - Realization of need and benefits
Successes (continued)

- Education and Awareness

- Interagency Cooperation and Coordination
  - Generally issue-specific, not programmatic
Male Fish Producing Eggs in Potomac River

William Cocks for National Geographic News
November 3, 2004

Something fishy is happening in the headwaters of the Potomac River. Scientists have discovered that some male bass are producing eggs—a decidedly female reproductive function.

In June 2002 reports appeared of fish die-offs in the South Branch of the Potomac River. The West Virginia Division of Natural Resources asked U.S. Geological Survey (USGS) scientists to examine fish health in the watershed near the town of Moorefield, about three hours’ drive from Washington, D.C.

Anglers were also reporting fish with lesions. USGS scientists determined that some of the lesions indicated exposure to bacteria and other contaminants.

The following year, the USGS conducted a more intensive assessment with a statistically significant number of fish, this time looking for internal damage. That’s when they discovered a so-called intersex condition—where one sex exhibits both testicular and ovarian tissue.

“It was not something we were really...
Impediments

#1 = FINANCIAL RESOURCES!

- Diminishing resources for programs, monitoring, incentives, enforcement, education, assistance

- Education and Awareness
  - Inadequate understanding among different communities
  - Education of issues and opportunities

- Coordination not Competition
  - individuals, agencies, communities, interests

- Inflexibility
  - established system unable to respond to new issues
  - Engrained mindsets with little incentive to consider change

- Political and Legislative will
Established Conventions and Methodologies (CWA, Standards, Assessments, TMDLs, Permits and Incentive-based programs)

- Inadequate system based on historical issues of concern – need new flexibility and capabilities
- Good system of checks and balances – ensures adequate protection of people and the environment
- Inconsistent and unfair system without needed tools.
Ecosystem Services: Introduction to Ecosystem Services

Ecosystem Services: Some Basic Concepts
Steven E. Kraft
Agribusiness Economics
Southern Illinois University

The Economics of Ecosystems
Sabina L. Shaikh
University of Chicago

The Illinois River Now in 3-D
Randy Vogel
Applied Ecological Services
Ecosystem Services: Some Basic Concepts

Steven E. Kraft
Dept. of Agribusiness Economics
Southern Illinois University Carbondale
sekraft@siu.edu
Ecosystem Services

- Ecosystem services are the goods and services derived from natural and managed ecosystems upon which human welfare depends.
The Diversity of Ecosystem Services-Examples

- Fresh water
- Water supply and ground water recharge
- Flood mitigation
- Habitat
- Soil
- Maintenance of air quality
- Noise abatement
- Nutrient storage and recycling (N, P)
- Pollution control and detoxification
- Pollination of crops
- Maintenance of biological and genetic diversity
- Eco-tourism, recreation
- Food and biofuels
• Ecosystem services (ESS) and human welfare

• Current status of ecosystem services:
  – 60% of ESS degraded or used unsustainably
  – Provisioning Services
  – Regulating/Supporting Services
  – Cultural Services
Frequently, an analogy is used between capital and ecosystems: both yield valuable flows of services.

The former yields interest which is easily valued and sought by individuals and society.

The latter yields a range of services which while valuable are problematic in terms of valuation.

However, increasingly ecosystems in the context of providing ESS are being referred to as “natural capital”.
1993 floods on the Mississippi River, losses estimated at $15-20 billion dollars, USGS:
http://mo.water.usgs.gov/Reports/1993-Flood/

NASA Photos 1991, 1993
2008 Summer Flooding

Cedar River, June 14, 2008, in Cedar Rapids, Iowa.

(AP Photo/Jeff Roberson)
If ESS are so important, why these challenges and changes?
A Mixture of Explanations

- Some “Obvious”
- Some “Less Obvious”
Increases in population and consumer demands associated with changes in standards of living put pressures on diverse ecosystems for more food, feed, fresh water, timber, fiber, fuel, etc. creating frequently competitive pressures on the provisioning of associated ESS.
Less Obvious Explanation - 2

• Lack of understanding of the complex relationships among ecosystems, the diverse flows of ecosystem services they support, and the vital roles these services play in sustaining humanity.

• Lack of awareness on the part of the public in general and politicians in particular about the role of ESS.
Consequences - 2

• No incentives to
  – (1) protect or enhance the ecosystems that provide the ESS
  – (2) provide funding to learn more about the complex interrelationships among ecosystems, ESS, and Quality of Life
  – (3) develop, evaluate, and implement alternative policy tools to enhance the provisioning of ESS
Consequences - 2

• A significant role for public policy to support research into these complex relationships
  – The coupling of complex ecological and socio-economic relationships
  – Development of policy relevant tools: nonregulatory and regulatory
  – Financing of long-term, interdisciplinary research
  – NSF; USDA-CSREES, FS, NRCS; NIH-National Institute of Environmental Health; EPA; other federal and state agencies; and NGOs
Less Obvious Explanation – 3: the public goods problem

• Many of the ESS are public goods
  • one person’s utilization of the good does not prevent others from also using it
  • it is not possible to prevent people from having access to the good once it is provided
  – In short, there are few incentives for anyone to provide these services, e.g., hard to market them for a profit
  – Hence, they tend to be under produced (or supplied) from private lands relative to societal demand
Many ESS come from ecosystems on privately owned lands. If given the option to convert a unit of land from an ecosystem producing an ESS such as flood mitigation to a commercial use such as corn for ethanol, the land owner has an incentive to make the switch.
Consequences - 3

• Need to develop mechanisms/incentives for landowners to maintain and/or enhance the provisioning of ESS
  – The case of NYC’s water supply
  – Filter strips on riparian lands
  – Payments for carbon sequestration

• Mechanisms/incentives need knowledge
Policy Challenges: markets or other mechanisms

- Market solutions are attractive given their relative efficiency and low cost in resource allocation, price discovery, among other factors.
- Creating markets for "new" commodities or services is not always a "slam-dunk":
  - Items to consider for a new market in an ESS
  - Government as midwife
- Frequent separation between where an ESS is "produced" and its effect
ESS and Policy Challenges:
markets or other mechanisms (nonregulatory or regulatory)

• ESS maintenance as a requirement of land stewardship
• ESS Management Districts
• Management for ESS on public lands
Ecosystem Services and Policy

• Maintenance or enhancement of the flows of ecosystem services

• Systems approach to understanding the complexity of the relationships among a mix of ecosystems providing a diversity of ecosystem services, traditional commodities and services while supporting human welfare

• Challenge for the 21st Century—developing policy tools to ensure the future viability of ecosystem services in adequate quality, quantity, timing, and location of availability

• A role for adaptive management
The Economics of Ecosystems

Sabina L. Shaikh
University of Chicago

12th Biennial Governor’s Conference on the Management of the Illinois River System
October 2009

Session B-1 Ecosystem Services: Introduction to Ecosystem Services

The High Line, New York City 2009
Economics and the Environment

- **Natural Resource Economics**
- **Environmental Economics**
- **Ecological Economics**
- **Neoclassical Economics**
  - Comparison of costs and benefits
  - Invisible Hand – Markets
  - Market Failure
    - Public Goods
    - Externalities
      - Private Cost (+External Cost) Vs Private Benefit (+External Benefit)
  - Market Solutions for Market Failure
    - Examples: Clean Air Act SO$_2$ Trading Program, Conservation Reserve Program, Mitigation Banking
Economics and Ecosystems

- Economic Growth and Ecosystem Protection
- Nature as an Investment/Asset
- Political buzz
  - Green Economy
  - Green Jobs
  - Green Infrastructure
- Economic Incentives
  - Ecosystem Service Provision
  - Price as an Incentive
  - Flexible Mechanisms
- How to generate social benefits from private decision makers?
- Economic Valuation—“Nonmarket” Valuation
Ecosystem Goods and Services

- Rural and Urban Eco-service Provision
- Marketable Goods: Fish, Lumber, Crops
- (Some) Ecosystem Services
  - Recreation
  - Habitat, Biodiversity
  - Carbon Sequestration
  - Soil Management and Erosion Control
  - Flood Control
  - Groundwater Recharge and Storage
  - Water Purification
  - Waste Decomposition
  - Climate Regulation
  - Pollination Services

Chicago City Hall Green Roof 2009
Economic Valuation Methods

- Why consider the economic value of ecosystems and ecosystem services?
- Non-Market Valuation for Environmental Quality
  - Revealed Preferences
    - Property Values
    - Travel Costs
  - Stated Preferences
    - Contingent Valuation
- Bio-Economic Models for Natural Resource Management
- Replacement Costs, Avoided Costs, Costs of Treatment
- Secondary Applications
  - Benefit Transfer and Meta Analysis
- Linking to Spatial Analysis and Ecosystem Mapping
Components of Ecosystem Valuation

Human Actions (Private/Public) → Ecosystem Structure & Function

Ecosystem Goods and Services

Values

Ecological Production Function

Economic Valuation Function

Adapted from *Valuing Ecosystem Services*, National Academy of Sciences 2005
Challenges to Economic Valuation of Ecosystems

- Understanding the linkage between the structure and function of natural systems
- Relationships are Dynamic & Spatial
- Complex: One Service Vs Entire Ecosystem
  - Valuing a Park for Recreation
  - Valuing a Forest for Carbon Sequestration
- Creating Indicators for Economic Valuation
  - Air Quality Indicators – Changes in Health, Visibility
  - Water Quality Indicators – Changes in Health, Fish Populations, Recreation
  - Ecosystems, Biodiversity…
- Integrating Ecological Models and Economic Valuation from the Ground up
Policy Implications of Economics and Ecosystems

- Who owns the services provided by private land? (Clean Water Act Vs Farm Bill)
- **Property Rights**: Pay to Pollute or Get Paid Not to Pollute
- Aligning Private and Social Costs and Benefits
- Payments for Environmental Services (PES)
  - Conservation Reserve Program, Shoreline Protection Programs, Debt for Nature Swaps, Developing Country Programs
- Purchases of Eco-Services as compensation for social benefit provision
  - Droughts: Wetlands Purchases in Georgia, Everglades and Sugar Companies
  - Rainforest development rights for carbon and climate regulation
  - Tax Credits and Grant Programs

Florida Gulf Coast Dune Habitat 2009
Markets for Ecosystem Services

- Ecosystem Service Valuation is Evolving
  - Understanding interdependency of functions and services
  - Development of standardized methods and acceptable indicators

- Markets are Emerging but not Well Established
  - *Payments for Environmental Services*
  - *Markets for Carbon Mitigation*
  - Participation and Information: Farmers know how to market crops but ecosystem services?
  - Accounting and Verification
  - Additionality, Tradeoffs

- Precedent of Paying Polluters
  - “Polluter Pays” vs Pay not to Pollute
  - Moral Hazard?

- Economic Valuation can Improve Information and Reduce Transactions Costs for Markets
Example: Agricultural Land Conversion In Canada

- Farmers indicate significant private benefits exist but large-scale tree planting not happening voluntarily due to transaction costs, information, uncertainty
- Private provision of tree planting < Socially Optimal Level due to positive externalities
- Payment Proposed for external benefits from carbon mitigation
- Total Costs of Land Conversion with Payment
  - Hybrid Popular Costs $10.76 to $23.25 per t CO2
  - Native Species Costs $30 to $125 per t CO2
- Compare Costs to other CO2 reduction strategies.
- Compare Related Ecosystem Services of strategies
- Big Driver: Uncertainty in Markets for Carbon
The Illinois River
Now in 3-D
The Illinois River in 3-D

- Dammed
- Diked
- Damaged
Natural vs. Developed Runoff

Surface Water Runoff Amounts
Comparison of Runoff Amounts for Hypothetical Development Scenarios in Liberty, MO

Introduction to Ecosystem Services
© Applied Ecological Services, Inc.
Natural vs. Developed Runoff

Bankfull Duration

For 24-hour duration, 2-year recurrence interval storm in Liberty, MO (Assuming adequate stormwater detention to not exceed 2-year release rate for natural conditions)
2001

- Impervious surfaces
  - 505,000 acres
  - 19.3% of total area
Development impacts
water volume, rate & quality…
Stormwater Management Objectives

• Flood Control
  – Surface Discharge Rate/Volume Control
  – Conveyance
• Base Flow Augmentation
• Water Quality Improvement
Water Quality Considerations

• Design for frequent storm events since all rain events wash contaminants away from source
• Need to remove contaminants from stormwater runoff
• System design is a function of both contaminant mass and contaminant concentration
• 90% of surface runoff volume occurs with storms having recurrence interval of 2-years or less
Negative impacts of a traditional stormwater approach...

- **Quantity:** Increase stormwater runoff volumes into downstream water resources
- **Timing:** Rapid and unnatural swings in water levels
- **Quality:** Inputs that degrade water quality in our rivers, lakes and wetlands
  - Nutrients
  - Contaminants
  - Sediments
Ecological Stormwater Management Principles

• Manage stormwater where it hits the ground.
• Manage stormwater throughout the watershed.
• Give stormwater an opportunity to infiltrate and evaporate.
• Manage volume, rate, and water quality of stormwater.
• Integrate stormwater management to contribute to the community aesthetic and sense of place.
Ecological Stormwater Management Principles

• Provide stormwater management projects that work at all scales from regional to backyard.
• Reduce project short and long-term costs by reducing engineering infrastructure and use “nature” where possible to manage water.
• Retrofit stormwater management opportunities in the community.
Sustainable Stormwater Management

• Duplicate Natural Runoff Volume and Rates
  – Surface Runoff
  – Infiltration
  – Evapotranspiration

• Manage the Precipitation Where it Hits the Ground

• Management Options
  – Retention and Extended Detention
  – Infrastructure Design
  – Land Use Changes
Best Management Practices: The Stormwater Treatment Train

Precipitation  Rain Garden  Bio-Swale  Cleansing Meadow Buffer  Naturalized Detention Basin  Treatment Wetland

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**Rain Gardens**

**Benefits:**
- Source management of first flush of precipitation
- Deep rooted native plantings enhance infiltration
- First stage of filtering process
Rain Garden Example

Before…

After…
Rain Garden Example
Bio-Swales

Benefits:

• Collects water from hard surfaces such as roads and driveways
• Filters and moves water to ponds and treatment wetlands
Meadow Buffers

Benefits:

- Deep rooted grasses and forbs absorb and infiltrate water
- Slows and filters water
**Treatment Wetlands**

**Benefits:**

- Provide aerobic and anaerobic conditions for the breakdown of nutrients and pollutants in the water
- Removes nitrates and hydrocarbons
- Creates habitat

---

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Wetland Biofiltration/Detention

25' MESIC PRAIRIE BUFFER

3'-4' WET PRAIRIE

5' EMERGENT PLANT SHELF

4:1

3:1

6" MAX. DEPTH
Use Of Restored Prairies And Wetlands (Not Storm Sewers)—SAVES $$$.

**Stormwater Treatment Train**

- **Total suspended solids**
- **Phosphorus**
- **Nitrogen**
- **Metals**
- **Hydrocarbons**

*Source management*
Stormwater Treatment Train (STT) Elements Integration
Results of the Stormwater Treatment Train . . .

• Improved water quality.
• Reduced run off rate and volume.
• Increased infiltration and groundwater recharge.
• Natural discharge and maintenance of base flow.
• Improved habitat.
• Reduced erosion and sedimentation.

*Provides the backbone of your green infrastructure for wildlife, trails, and parks.*
Aesthetic and Functioning
Stormwater Management Systems

Vegetated Biofilter Wetland

Traditional Detention Pond
NATURE is beautiful, provides multiple-benefits, free services and functions that we cannot replace.
Commitment…
Commitment…
COMMITMENT!!

A VISION!!

PARTNERSHIPS!!
# A VISIONARY TEAM

<table>
<thead>
<tr>
<th>TEAM MEMBER</th>
<th>ROLE</th>
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<tbody>
<tr>
<td>Local Government Member</td>
<td>Provides Community Vision, Applies conservation principles, Approves the project</td>
</tr>
<tr>
<td>Owner/Developer</td>
<td>Initiator, Overseer &amp; Financial Purveyor</td>
</tr>
<tr>
<td>Ecologist</td>
<td>Natural Systems Analyst &amp; Restoration Specialist</td>
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<tr>
<td>Specialist</td>
<td>Geotechnical, Arborist, Farmer, Other</td>
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<tr>
<td>Landscape Architect/Planner</td>
<td>Spatial &amp; Aesthetic Analyst &amp; Designer, “Arranger of Space”</td>
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<tr>
<td>Engineer</td>
<td>Civil: Hard Systems Specialist &amp; Designer</td>
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<td></td>
<td>Hydrologist: Water Quality &amp; Management Specialist</td>
</tr>
<tr>
<td>Architect</td>
<td>Architectural Solutions (Structural &amp; Thematic/Ornamental)</td>
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<tr>
<td>Attorney</td>
<td>Codifier, Covenants &amp; Restrictions Writer</td>
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<tr>
<td>Construction Manager</td>
<td>Builds it</td>
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<tr>
<td>Realtor</td>
<td>Sells it</td>
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<tr>
<td>Land Steward</td>
<td>Monitors &amp; Maintains it</td>
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<tr>
<td>Homeowner</td>
<td>Buys it, Lives it, Enjoys it!</td>
</tr>
</tbody>
</table>

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Applied Ecological Services, Inc.

“Our vision and ethic is to bring the science of ecology to all land-use decisions.”

- Practice sound ecosystem science
- Work at all spatial scales
- Strive for ecosystem health
Local Actions Deliver National National Results
Brad McMillan
Institute for Principled Leadership in Public Service

Strategies for Sustainable Unwanted Medicine Collection Programs:
In Communities, In the Classroom, and Beyond
Elizabeth Hinchey Malloy and Robin Goettel
Illinois Indiana Sea Grant

Stormwater Education and Outreach by a Nonprofit
Michael Brown
Ecology Action Center, Normal, Illinois
Local Actions Deliver National Results

BRAD MCMILLAN
INSTITUTE FOR PRINCIPLED LEADERSHIP
IN PUBLIC SERVICE
“Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it’s the only thing that ever has.”

Margaret Mead
Illinois River Watershed

- Watershed Size – 21,024 square miles
- Stream Miles – 31,800
- Population (1997) – > 90% of the state’s population
- Water Uses -
  Public Drinking Water Supply
  Recreation
  Transportation
History of the Integrated Management Plan

- Illinois River Valley Partnership
- Model Projects
- Ecosystem Restoration Plan
All approved recommendations meet the following criteria adopted by the participants:

- Efforts must be based on planning and grassroots coalition-building that includes local citizens and all levels of government.
- Both the public interest and private property rights must be recognized, and all actions must strive to maintain a balance between the two.
- Priority should be given to voluntary and incentive-based actions.
Integrated Management Plan Recommendations

All Recommendations are based on the following assumptions adopted by the participants:

- The Illinois River is a national treasure.
- Long-term economic health and ecological health are interdependent.
- Responsible stewardship is key to our future quality of life.
- Natural processes provide guidance for ecological improvement.
- Education with sound information provides a foundation for wise decisions.
- Progress from committed group effort can surpass any individual results.
- Individuals are responsible for their actions.
- By their actions, individuals make a difference.
Recommendations By Category

- In the Corridor
- Soil & Water Movement
- Agricultural Practices
- Economic Practices
- Local Action
- Education
Integrated Management Plan Recommendations

“Seize those that are important to you, as a developer, farmer, city planner, elected official, scientist, parent, landowner, conservationist, entrepreneur, volunteer, educator or whatever your vocation or avocation may be.”
Local Action (Recommendations)

1. Enhance local awareness and capabilities to address watershed/water resource concerns through education and technical assistance and by providing funding for volunteer watershed management planning for each watershed.
2. Develop a local watershed plan with full community participation.
3. The local steering committee selects and adopts an organizational structure, involving appropriate agencies, to ensure that implementation of the watershed plan has sustained attention in the future throughout the watershed.
4. Encourage municipalities and counties to adopt and enforce comprehensive stormwater management ordinances that are tailored to address local needs and consistent with model ordinances and watershed plans. This recommendation is key for establishing new standards throughout the watershed for reducing runoff.
5. Encourage local government (or appropriate groups of local governments) to adopt and implement wastewater management plans, including septic system inspection/maintenance programs, beneficial reuse of wastewater, preventive maintenance, and other elements of facilities planning.
6. Reduce runoff rates throughout the watershed during the next 15 years through remedial and preventive efforts. This recommendation is key for establishing new standards for reducing runoff.
7. Implement regional strategies to protect, restore, and expand critical habitats in key high-quality tributaries throughout the watershed and headwaters of tributaries in northeastern Illinois.
Local Action (Recommendation #1)

- Enhance local awareness and capabilities to address watershed/water resource concerns through education and technical assistance and by providing funding for volunteer watershed management planning for each watershed.
Local Action (Recommendation #2)

- Develop a local watershed plan with full community participation.
Local Action (Recommendation #6)

- Reduce runoff rates throughout the watershed during the next 15 years through remedial and preventive efforts. This recommendation is key for establishing new standards for reducing runoff.
Senachwine Creek Watershed

- 53 Projects Constructed
  - Terraces - 47,000 feet
  - Grass Waterways - 25 acres
  - Water and Sediment Control Basins – 38
  - Grade Stabilization Structures – 2

- This project prevented an estimated 23,600 tons of soil from entering the Illinois River annually.
Old Salem Chautauqua Wetland
Springbrook Creek Project
The Grove (Kickapoo Creek)
Local Action (Recommendation #7)

- Implement regional strategies to protect, restore, and expand critical habitats in key high-quality tributaries throughout the watershed and headwaters of tributaries in northeastern Illinois.
Conservation Reserve Enhancement Program (CREP)

- Eight federal and state agencies and 45 SWCDs are cooperating in efforts that have focused more than $500 million for restoring more than 232,000 acres of floodplain, wetlands, and adjacent erodible land in the Illinois River Watershed.

- This program would not be a success without the involvement of the local landowners and planning groups.
Ecosystem Partnerships

- **Purpose** – Integrate the interests and participation of local stakeholders to enhance and protect watersheds through ecosystem-based management.

- **Components:**
  - Assessment and Monitoring
  - Integrated Technical Assistance
  - Ecosystem Project, Planning and Support Grants
  - Ecosystem Interpretation and Education
Mossville Bluffs Watershed Program

Prepared for: Tri-County Regional Planning Commission, City of Peoria, and Peoria County

October, 2002
Streambank Cleanup And Lakeshore Enhancement
Conclusion

A Decade of Changes in the Illinois River Watershed

“Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it’s the only thing that ever has.”
- Margaret Mead
STRATEGIES FOR SUSTAINABLE UNWANTED MEDICINE COLLECTION PROGRAMS: IN COMMUNITIES, IN THE CLASSROOM, AND BEYOND

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ABSTRACT

Medicines are produced in increasing volumes every year and the rate of development of new medicines also continues to grow. With this growth comes concern regarding the environmental fate of unwanted medicines. Recent studies have identified pharmaceutical compounds in fresh and marine waters nationwide, and several of these bioactive compounds are potentially harmful to aquatic organisms, even in small quantities. Additionally, improper medicines disposal poses poisoning risks to children, the elderly and pets and can lead to medicine and/or identity theft. Unused medicines may accumulate in homes or be flushed, placed in the trash, or given to others, all of which have significant disadvantages. One approach for decreasing amounts of unwanted medicines reaching the environment is the organization of collection programs that ensure safer methods of disposal. Illinois-Indiana Sea Grant has developed a toolkit, *Disposal of Unwanted Medicines: A Resource for Action in Your Community*, to establish safe, legal collection programs in communities. We focus on collection events for the public as a partial solution to the problem. Our new educational initiative provides tools for youth and their families to play an active role in this issue through education and outreach strategies for best practices for safe disposal of unwanted medicines. Unwanted medicine disposal information is being disseminated through the creation of programming and activities for 4-H youth, scouts, and after-school youth clubs. Youth in these non-formal education programs will serve as an important agent for change to help protect and improve the quality of our waters. Our partnership with the innovative and successful Prescription Pill and Drug Disposal Program (P2D2) Network will also be presented.

INTRODUCTION

The fate of unused medicines is a rapidly emerging concern that spans a broad range of issues including human and environmental health, water quality, solid waste management, law enforcement, and the health care industry. Substances of concern include both prescription and non-prescription medicines, and this category is sometimes expanded to include cleansing agents, cosmetics, nutritional supplements, and skin care products. A common term used for this suite of compounds is pharmaceuticals and personal care products (PPCPs). There are thousands of products that fall into this classification; all of these substances are specifically designed to interact with biological processes and are widely used around the world. They can enter the environment when people dispose of medicines via trash or toilet, or after use when they are excreted in their original or metabolized form or rinsed off the skin in the case of topical applications (Daughton and Ternes 1999).

The Issue

Medicines are produced and prescribed in increasing volumes every year. In the United States, sales of over-the-counter medicines have increased by 60% since the 1990s¹. In 2008, total sales for prescription medicines in the United States reached $291.5 billion, a 1.4 percent increase from 2007 (Ruiz 2009). With these increases comes concern about the fate and effects of these compounds in the environment. Recent studies have identified a wide range of pharmaceutical chemicals in rivers, streams, and groundwater nationwide (Kolpin et al. 2002, Barnes et al. 2008), and it has also been shown that some of these compounds are potentially harmful to aquatic organisms, affecting reproduction and development even at very low concentrations in some cases (cited in Daughton and Ternes 1999). The fate of pharmaceutical chemicals in sewage sludge is also of concern (Kolpin et al. 2002), as sludge from wastewater treatment is often applied to agricultural land as a fertilizer. The long-term impacts of medicine disposal on our

health and the health of the environment are not fully known. However, unless action is taken, the quantity of these chemicals reaching our waterways will continue to increase as pharmaceutical usage increases. Thus, Illinois-Indiana Sea Grant recommends a precautionary approach to this issue.

So what can be done? The issues surrounding medicine disposal are complex. Improper disposal of unwanted medicines can pose a risk to children and pets. For example, medicines placed in the trash without taking precautions to secure the container, make the medication unpalatable, or disguise the content are potentially accessible to children and pets, sometimes resulting in unintentional poisonings. Medicines disposed with their original labels intact can result in identity theft and medicine theft. This is an especially important issue for the elderly, who are the biggest consumers of prescribed medicines.

In early 2007, the Office of National Drug Control Policy issued guidelines for proper disposal of prescription drugs, following on the heels of several states providing advice to their citizens. This guidance was most recently updated in October 2009 and is available at http://www.whitehousedrugpolicy.gov/publications/pdf/prescrip_disposal.pdf. The three main components of the national guidelines are:

1. Don’t flush medications down the toilet unless the label specifically instructs you to do so and instead,
2. Take advantage of community take-back programs or other programs that collect medicines at a central location for proper disposal. If a take-back or collection program is not available, then
3. Remove labeling from packaging and dissolve solid medications, mix with unpalatable items (kitty litter, coffee grounds, etc.) and seal in a bag before placing in the trash.

Several states have adapted these suggested guidelines and issued state-specific advice to ensure compliance with specific state hazardous waste and household waste regulations. These strategies include the opportunity to mail or bring unused medications to various collection points, such as pharmacies and community collection events, for eventual destruction. Options such as mixing with plaster, crushing the pills, and locking up medication if it can be done safely until the next community collection have also been suggested. All of these approaches to medication disposal play roles in reducing the introduction of pharmaceuticals to the environment. A summary of current disposal practices for unwanted residential medications in the United States is provided in a review by Glassmeyer et al. (2008).

Disposal to trash is considered to be an interim solution because medicines placed in landfills are likely to slow the transport of the chemical to waterways or sludge, but landfill leachate can ultimately reach wastewater treatment plants and local streams and rivers (Barnes et al. 2004). Illinois-Indiana Sea Grant believes that currently, the best disposal solution is incineration of medications in a regulated incinerator. There is, however, a very long list of hurdles to overcome before a national disposal plan can be implemented that is protective of humans, wildlife and pets and their shared environment. These hurdles include identifying safe and convenient medicine collection pathways, determining who will pay for this service, and minimizing the need for disposal through smarter prescribing and smarter consumer choices to save healthcare dollars and resources.

The Illinois-Indiana Sea Grant resource kit, Disposal of Unwanted Medicines: A Resource for Action in Your Community was created to help communities design, establish and implement safe and legal unwanted medicines collection programs. One component of a successful program is identifying the best way to engage the community and let them know when the collection will occur and what can be brought to the event. Included in the kit are several examples of pamphlets, fact sheets and education materials that have been developed by communities and states as they wrestle with this complicated issue. The recommendations and advice vary because jurisdictions are finding different ways to deal with the fact that only interim solutions are
available currently. These outreach materials can be adapted and used by other communities to save time and funds.

The good news about this issue is that it touches upon so many different aspects of our lives that there is no end of partners to join with to educate and reach out to the public. This issue impacts the elderly through medicine and identity theft issues, accidental poisoning, and health care costs. It matters to the police because prescription drug abuse by teenagers is on the rise. In 2008, 15.4% of 12th-graders reported using a prescription drug nonmedically within the past year (Johnston et al. 2009). Concerns for the safety of children and pets also can drive behavioral change. Furthermore, medications that go unused are a significant waste of health care dollars. And for all of us, our health depends on the health of our environment, including rivers and streams and the creatures that live in them.

BACKGROUND: DISPOSAL OF UNWANTED MEDICINES

For many reasons, medicines are not always entirely used and therefore remain and may eventually expire in the hands of consumers or health care facilities. Some reasons for this include:

- Improvement of the patient’s medical condition
- Patient or doctor decides to discontinue use of the medication due to side effects or lack of therapeutic effect
- Patient death
- Packaging contains more medication than the patient needs, e.g. with over-the-counter or prescription medicines bought in bulk

Disposal of unwanted medicines is an issue both for households and healthcare business such as hospitals, hospices, rehab centers, assisted living facilities, clinics, and pharmacies. Health care businesses’ disposal practices are regulated at the state and federal level. Some medications are classified as hazardous waste because they contain or are preserved with hazardous chemicals (e.g. mercury, radioactive components) and therefore most states have specific regulations surrounding pharmaceutical disposal. The U.S. Environmental Protection Agency is currently considering including pharmaceuticals in the federal Universal Waste Rule set forth in 40 CFR part 273 which, if adopted by individual states, would allow for easier management of household medicine waste.

Current Disposal Patterns by Individuals

A 1996 survey (Kuspis and Krenzelok 1996) examined the expired medicine disposal habits in 100 pharmacies and 500 patients. The survey found:

**Pharmacies:**
- 97% had established policies regarding the disposal of undispensed, expired medicines
- However, only 5% had consistent recommendations for customers on medicine disposal

**Patients:**
- 54.0% disposed of medicines in the trash
- 35.4% flushed medicines down the toilet or sink
- 7.2% did not dispose of medicines
- 2.0% used all medicines prior to expiration
- 1.4% returned medicines to the pharmacy

Risks of Unsafe Medicine Storage and Disposal

1. **Accidental poisoning:** Medicines are the most common poison exposure category in the United States, and unsecured storage or disposal via the trash is a significant source of accidental poisoning. In the United States, approximately 30 children under age 5 years of age die as the result of unintentional poisoning annually (U.S. Consumer Product Safety Commission 2005).
Furthermore, data from the National Electronic Injury Surveillance System also indicate that in 2003, an estimated 78,000 children under age 5 were treated for poisonings in U.S. hospital emergency rooms (U.S. Consumer Product Safety Commission 2005). Additionally, as the biggest consumers of prescription medicines, it is possible for senior citizens to misuse and self-prescribe medicines, using out-of-date medicines from past ailments to treat new, undiagnosed symptoms. Having a large number of medicines in the home can contribute to confusion over proper dosages and which pills to take when.

2. Diversion and drug abuse: Medicines are sometimes misappropriated for consumption or sale by family members and friends, workers in homes, and by burglars. Storing numerous medicines in the home or throwing excess medicines in the trash without first securing them can lead to this type of misuse. The National Survey on Drug Use and Health found in a nationwide study that 12% of young adults (ages 18-25) used prescription pain relievers non-medically in 2005 (Office of Applied Studies, Substance Abuse and Mental Health Services Administration 2006). Of these users, 67% obtained them from a friend or relative, as compared to 14% who had the medicines prescribed to them by a doctor. The 2006 “Monitoring the Future” Survey conducted by the University of Michigan reported that although illegal drug use by American teens dropped more than 23% from 2001-2006, their abuse of medicines, both over-the-counter and prescription, was rising (Johnston et al. 2007).

3. Economic waste: Medicines thrown in the trash or flushed down the drain represent wasted health care dollars. Studies identifying the types and quantities of medicines that go unused could lead to better-informed prescription practices and better advice to patients on how to properly take prescriptions.

4. Improper medicine donations: In response to humanitarian crises, large quantities of medicines are sometimes donated internationally. If the donations do not match the need, or if the donated medicines are expired or otherwise unusable, significant disposal problems can arise overseas, as the receiving areas may have impaired waste treatment systems. Because there have been several cases where unusable medicines have been donated, in most cases with the best intentions, to international relief organizations during crises, the World Health Organization discourages donation of unwanted medicines from collection events (World Health Organization 1999). This is especially important as environmental safeguards for proper disposal of unusable medicines may not be available in these countries.

5. Environmental impact: Waste discharged through sewage systems can contaminate water resources in the surrounding environment. Pharmaceutical chemicals in waterways pose a potential for deleterious effects on wildlife. Wastewater treatment plants (WWTPs) are not designed to treat chemicals in medicines. Therefore, when flushed down the toilet or sink, some pharmaceutical chemicals pass through the WWTP altered or unaltered and can enter rivers, lakes, living organisms, and groundwater (Daughton and Ternes 1999). Additionally, some of these chemicals remain in the sewage treatment plant’s sludge, which is frequently applied to agricultural land as a fertilizer (Daughton and Ternes 1999).

Research is currently underway to develop treatment technologies at WWTPs because excreted medicines as well as unaltered parent compounds reach the treatment facilities (Daughton and Ternes 1999). This suggests that wastewater treatment at the WWTP will ultimately be very expensive, require a mixture of technologies, and may be a many years into the future. Removing purposeful disposal of unwanted medicines from the wastewater stream will decrease the amount of these chemicals entering the environment while technologies are being developed for the WWTP.
Trash disposal is recommended when collection programs are not available, however this pathway also has several significant disadvantages and may cause the same impacts as flushing. Most medicines are soluble in order to enter the blood stream or to reach other tissue. Thus when placed in landfills where water is moving through the waste, these chemicals can still reach waterways or be collected as part of leachate collection systems and end up in WWTPs.

Some pharmaceutical chemicals (e.g. anti-epileptics) persist in the environment; others are “pseudo-persistent”, in that they break down quickly but are continually replaced because of continual inputs. The concentrations of individual pharmaceutical chemicals detected in the influent of sewage treatment plants are typically in the range of a few parts per billion, while concentrations in treated effluent are usually lower, in the range of several hundred parts per trillion up to several parts per billion, depending on the chemical. As the effluent is diluted when it discharges into a river, the concentrations in waterways tend to range from undetectable to a few hundred parts per trillion. In sewage sludge, concentrations are sometimes much higher as the sludge is compacted.

Researchers have found that chronic exposure to low levels of pharmaceutical chemicals, within the same range of concentrations as has been observed in some waterways, can have significant effects on aquatic animals including fish (Palace et al. 2002, 2006) and lobsters. At present, the greatest concern regarding pharmaceutical chemicals in the environment is their potential effects on small aquatic organisms. This is mainly because these organisms have short generation times, hence multiple generations are easily exposed. Because of this, there is a greater likelihood that effects will not be restricted to individual organisms but instead will accumulate over time to result in population-level effects.

Pharmaceutical chemicals identified in the environment are generally present in concentrations several orders of magnitude lower than the concentrations known to exert effects on humans. This makes direct human toxicity seem unlikely but does not rule out the possibility of subtler long-term effects that are harder to detect and the exposure is to a vast mixture of compounds that we are unable to measure. Some scientists believe that low-level exposures to numerous drugs with the same or similar methods of action may add up to larger effects on aquatic organisms, that certain combinations of medicines may act synergistically to produce disproportionately large effects, or that other unpredictable interactions between chemicals may occur. It is possible that there were other substances of potential concern in the water that were unobserved in these studies simply because researchers did not sample for them, or because there are currently no analytical techniques capable of identifying them. Much research remains to be done in this area.

How do Pharmaceutical Chemicals Enter the Environment?

Residential, commercial, and agricultural pharmaceutical chemicals follow two primary pathways to wastewater treatment systems:

- Metabolic excretion: Many pharmaceutical chemicals are biotransformed in the body. Biodegradation alters the chemical structure of their active molecules, which, in turn, often results in a change in their physical and chemical properties. Metabolism is frequently incomplete, and excretion rates range from 0 to 100% (Kummerer 2004, Bound and Voulvoulis 2005). As a result, sometimes a significant fraction of the medicine is not absorbed into the patient’s body and instead is excreted. In some cases, metabolic processes alter the medicine, creating a different chemical that may be more or less toxic than the parent compound and may revert back to the parent form in the sewage treatment plant or in the environment. This same process is true for livestock or pets being administered medicines.
• Direct disposal: Disposing of unwanted or expired medicines can be a challenge for households. In the United States, few formal guidelines are available for individual consumers on medicine disposal, and, consequently, most of their unused medicines enter septic tanks, sewers, or landfills.

Once they have been discarded or excreted, pharmaceutical chemicals enter surface waters and groundwater through several pathways:
• Effluent from plants that treat household, industrial, and hospital wastewater
• Septic systems
• Runoff and groundwater from uncontrolled landfills or landfill leachate sent to WWTPs
• Controlled industrial discharges
• Commercial animal feeding operations and aquaculture
• Surface application of manure and biosolids
• Runoff from dog parks

In general, wastewater treatment plants were not designed to remove dissolved medicines from water. They were designed to remove solids, organic materials, and some nutrients such as phosphorus and nitrogen. At wastewater treatment plants, water goes through one, two or three stages of treatment, depending on the sophistication of the plant and the needs of the community served.

Septic systems represent another source of unwanted medicines to surface and groundwater, as they are also not equipped to break down pharmaceutical chemicals (Swartz et al. 2006). Researchers have discovered some estrogenic chemicals in groundwater down-gradient of residential septic systems, and new research indicates higher levels of these chemicals in ponds near areas of higher residential density².

RESIDENTIAL UNWANTED MEDICINE COLLECTION PROGRAMS IN ILLINOIS

The Illinois Environmental Protection Agency (IEPA) has launched an initiative in collaboration with partners in both the private and public sector to promote environmentally responsible disposal of unwanted and expired medications. Under a pilot program, IEPA has worked with several communities across the state, including county health departments, other local governments and pharmacies to provide expanded opportunities for collecting or dropping off unwanted medicines and personal care products. For additional information and a map of Illinois counties with medicine disposal locations highlighted, visit the IEPA website http://www.epa.state.il.us/medication-disposal. Four medicine take-back program case studies from Illinois are also profiled in the Illinois-Indiana Sea Grant Disposal of Unwanted Medicines: A Resource for Action in Your Community toolkit, available online at http://www.iisgcp.org/unwantedmeds/index.html.

PRESCRIPTION PILL AND DRUG DISPOSAL (P²D²) NETWORK

The P²D² program developed out of a research project undertaken by students in ecology and Illinois studies classes at Pontiac Township High School about the disposal of unwanted medicines. The students partnered with local pharmacies in Livingston County, Illinois, and undertook a multi-faceted campaign to provide their community with safe medicine disposal

options. The program adapted and evolved as they looked for sustainable approaches for their community. The program has since grown to include pharmacies in 25 Illinois counties, Washington, Texas, Wisconsin, and Michigan. The students developed collection bins, billboards, press releases, and contacted many federal, state, and local officials to help encourage local communities to reduce the amount of unwanted medicines being thrown away inappropriately and ending up in Illinois waterways. Illinois-Indiana Sea Grant works with communities that want to join the P²D² network by providing information needed to undertake safe and legal medicine collection programs and by providing funding for program advertisements and purchase of safe medicine collection bins for police stations. Pharmaceuticals that are collected by the P²D² program are sent for incineration in a regulated hazardous waste incinerator. Incineration is currently the most environmentally safe technology for the disposal of medicines. The process is highly regulated by the U.S. Environmental Protection Agency and significantly minimizes contamination of air particles compared with other medication destruction methods that could end up in Illinois waters.

The P²D² network also works with the state of Illinois to identify and coordinate collection programs state-wide. The state of Illinois provides funding for disposal and transportation of unwanted medicines through state contracts with hazardous waste haulers. Illinois is committed to the prevention of improper disposal of pharmaceuticals, environmental protection, and resource conservation efforts that have been established by Illinois-Indiana Sea Grant and the P²D² network. These efforts are driven and sustained by communities that are highly motivated to collect unwanted medicines.

STUDENTS AS AGENTS FOR CHANGE: INFORMING COMMUNITIES ABOUT PROPER DISPOSAL OF UNWANTED MEDICINES

In response to a growing national concern about improper disposal of unused or expired medicine and medicine misuse, educators from the University of Illinois Extension/Illinois-Indiana Sea Grant are creating two pilot education projects. Illinois-Indiana Sea Grant extension educators identified two target youth audiences to receive this information: high school students and 4-H youth. Two curriculum-based publications are in development for these youth audiences. The first is *The Medicine Chest: A collection of safe disposal curriculum activities and service-learning resources* (http://www.iisgcp.org/education/MedicineChest.pdf), a compilation of multidisciplinary, standards-based classroom lessons, sample stewardship activities, and background information for teachers and high school students. Activities included demonstrate how the improper disposal of unwanted medicines can be harmful to people, pets, and our waterways.

As they engage in these community stewardship activities, students will serve as “agents for change” in people’s habits to improve the quality of our waters. Students will develop lifelong skills as they provide useful information about medicine disposal to family members and various community sectors. Students who actively take part in *The Medicine Chest* activities will be equipped to deliver resource protection and health and safety messages to help people make conscientious decisions when disposing of medications and other household chemical products.

An important component of *The Medicine Chest* is the sample P²D² Project lesson plans developed by ecology, civics, language arts, music and art teachers at Pontiac Township High School (aligned with Indiana’s Academic Standards and National Science Standards). High school teachers will also be provided with numerous multidisciplinary approaches on how to engage students in successful service-learning projects and how to gather data from research-based background information, including Illinois-Indiana Sea Grant’s *Disposal of Unwanted Medicines* toolkit.

The second publication targeted to 4-H leaders and youth members is the 4-H Guide, *Disposal of Unwanted Medications*. Illinois-Indiana Sea Grant is collaborating with authors
Five inquiry-based lessons are included:

- **So, what’s the big deal?** A filtration experiment that teaches about wastewater disposal.
- **What are the issues?** Conducting research to learn about the history of disposal of unused and expired medicine; Taking a poll of citizens’ disposal activities.
- **What should I be concerned about?** Using online resources to acquire the latest data and to learn about the medications of primary concern; Preparing a report that describes contaminants found in local waterways.
- **What are my options?** Act upon the better alternatives and work to reduce flushing of medicines in their communities by investigating alternatives for proper disposal of expired and unused medicine and brainstorming ways to provide community education.
- **How can I let other people know about these issues?** Suggestions for how youth can share their knowledge through projects such as speeches, displays, demonstrations, mentoring a younger 4-H member, and outreach to older adults.

Our strategic collaborations with scientists, outreach specialists, educators, and curriculum specialists have yielded many benefits. Illinois-Indiana Sea Grant is well positioned to deliver education resources; conduct professional development training for both formal and non-formal educators, with the ultimate goal of providing youth with the necessary skills to take action, engage and inform others, and create awareness about an important topic that will help improve people’s health and safety, as well as the sustainability of our living aquatic resources.

**REFERENCES**


Stormwater Education and Outreach by a nonprofit

Michael Brown
Ecology Action Center
Normal, Illinois
ECOLOGY ACTION CENTER

Mission: To inspire and assist residents of McLean County to create and preserve a healthy environment.
Community Environmental Education

- Solid Waste
- Clean Water
- Energy Efficiency
Partnership with Municipalities

• City of Bloomington
• Town of Normal
• McLean County Highway Department
• Bloomington-Normal Water Reclamation District
Stormwater Runoff

• Rain is natural, stormwater runoff is NOT

• Up to 70% of pollution in our streams, rivers and lakes nationwide is carried there by stormwater
TMDL

- Nitrate and phosphorus levels occasionally exceed water quality standards in Lake Bloomington and Evergreen Lake
- Urban runoff in the watershed contributes to these problems
NPDES Phase II

- Requires operators of small MS4s to implement programs and practices to control polluted stormwater runoff
- Requires six minimum control measures
Six Minimum Controls

• Public education and outreach
• Public participation/involvement
• Illicit discharge detection and elimination
• Construction site runoff control
• Post-construction runoff control
• Pollution prevention/good housekeeping
Classroom Education
Take Home Message

We All Live Downstream
Let's Keep
Our Water Clean

- Don't Dump
  Recycle and dispose of motor oil, paint, antifreeze and hazardous waste properly.
- Reduce Lawn Chemicals
  Avoid fertilizing before storms and minimize pesticide use.
- Pick Up after Pooch
  Bury pet waste or dispose of with trash.

For questions about waste disposal and water quality call 309-454-3169
www.ecologyactioncenter.org

Stormwater Hotline:
Bloomington 434-2423
Normal 433-3403
Storm Drain Stenciling

DRAINS TO STREAM
KEEP IT CLEAN
Educational Doorhanger

Bloomington Clean Water Program

**DRAINS TO STREAM**

**KEEP IT CLEAN**

Have you seen this message in your neighborhood?

In your neighborhood, water from rain, snow melt or sprinklers flows over yards and pavement into storm drains. The water is not treated as it flows directly to our creeks, rivers and lakes. As water moves, it picks up natural and human-made pollutants. Your help is needed to prevent pollution of water that we use for swimming, fishing or drinking.

What are Sources of Pollution?

- Motor Oil
- Antifreeze
- Soap from washing vehicles
- Paint
- Fertilizers and pesticides
- Yard debris
- Trash
- Pet waste

The City of Bloomington and the Ecology Action Center are working together to protect our local waterways. Visit these websites to see how to protect the quality of our water and community:

- www.ecologyactioncenter.org
- www.citybloomington.org
- www.prairieinfo.org

Ecology Action Center

Clean Water Program

We All Live Downstream
Let’s Keep Our Water Clean

Don’t Dump

- Many service stations will recycle your motor oil.

Keep Storm Drains Clear

- Don’t rake or sweep leaves, grass or soil into the street.
- Vegetate bare or erosion-prone spots
- Do not litter. Help pick up litter.

Be Yard Smart

- Avoid fertilizing before storms.
- Minimize use of pesticides and lawn chemicals.
- Compost yard waste and use a mulching mower for grass clippings.
- If you live near a waterway, do not mow your grass up to the waterfront as increased vegetation will help filter out pollutants contained in runoff.

Around the House

- Direct downsputs away from paved surfaces on your property.
- During home improvement projects, sweep up all debris and clean paintbrushes inside.
- Use a commercial car wash or wash your car on a lawn.

Pick Up after Pooch

- Clean up pet waste frequently and dispose of properly.

Normal Storm Water Hotline: 433-3403

Local Action Makes a World of Difference

EcoCity Action Center
Rain Barrel Workshops
Rain Gardens

• Reduce stormwater runoff
• Directs water where it won’t be a problem
Public Displays and Brochures

Protecting Our Watersheds

Evergreen Lake and Lake Bloomington

Money Creek

www.mcleanlmdl.com

Significant Watersheds in McLean County

Sub-Watersheds in McLean County

Key to Features on this Map

Sub-Watersheds

Streams by Order

Lake Bloomington

Regional Drainage Basins

Subwatersheds

Streams and Tracts

County Boundary

Local Action Makes a World of Difference

Ecology Action Center
Special Events

ILLINOIS SUSTAINABLE LIVING & WELLNESS EXPO

Clean Water: The Ripple Effect

ECOLOGY ACTION CENTER
Yard Smart Program

Voluntary certification program to encourage sustainable yard care practices
The Chemical-Free Yard

- Makes for a safer play environment for children and pets
- Allows beneficial microbes, earthworms, and bugs to return to the soil for a healthier lawn
- Minimizes stormwater runoff contamination potential
Chemical Alternatives

- Compost tea
- Microbial inoculants
- *Bacillus thuringiensis*
- Beneficial insects
- Diatomaceous earth
- Hot pepper repellent
- Lemon and vinegar herbicide
- Predator urines
Landscaping with Natives

- Perennial Illinois native wildflowers, grasses, and shrubs are naturally drought resistant, disease resistant, and do well in Illinois soil types
- Once established, no watering is needed
- Vast native diversity to choose from
Composting

• Combination of waste disposal solution and free fertilizer
Yard Smart Garden Walk
Keep our water clean: be Yard Smart

www.EcologyActionCenter.org
Problem: Storm Water Runoff

- When it rains, storm water picks up pollutants such as fertilizers, pesticides, oils, garbage, and silt from lawns, driveways, golf courses, agricultural areas, streets, sidewalks, and other impermeable surfaces.
- This contaminated water discharges to creeks eventually entering larger bodies of water such as rivers and lakes, impairing their ability to serve as drinking water supplies or wildlife habitat.
- Water runoff is a form of non-point source pollution.
- Non-point source pollution is the nation's largest water quality problem, with consequences to our local drinking water supplies.
- YOU can be part of the solution to help protect our clean water!

Keep our Water Clean

How to Help:

- Use a rain barrel! It will reduce your water usage and the water runoff from your yard.
- Don't dump! Instead dispose and recycle hazardous wastes properly!
- Keep storm drains clear from leaves, grass, or litter.
- Reduce the use of synthetic pesticides and fertilizers because they contribute to water pollution. Instead use organic fertilizers!
- Wash your car on your lawn with biodegradable soap instead of your driveway to prevent water runoff!
- Be Yard Smart by composting extra waste, building a rain garden, avoiding mowing too close to waterways, and using native plants.
- Clean up pet waste properly.

For more information please contact the Ecology Action Center at 309.454.3169, or refer to our website at www.EcologyActionCenter.org.
Radio Spots

B104
Continuous Country Favorites

AM 1230
WJBC

101-S
WBNQ
Today's Best Music

GLT
89.1 • 103.5
Normal • Peoria
“DID YOU KNOW THAT WHEN STORM WATER PICKS UP POLLUTANTS IT CAN CAUSE CONTAMINATION PROBLEMS WITH WATER QUALITY AT PLACES LIKE EVERGREEN LAKE AND LAKE BLOOMINGTON? FERTILIZERS, PESTICIDES, OILS, GARBAGE AND SILT CAN ALL TOO EASILY END UP IN DRINKING WATER SOURCES LIKE THE LAKES. THE ECOLOGY ACTION CENTER HOPES YOU’LL TAKE PART IN ONE OF THEIR PROGRAMS THAT HELP PROTECT CLEAN WATER. GO ONLINE TO ECOLOGY ACTION CENTER DOT ORG TO LEARN MORE ABOUT PROGRAMS LIKE YARD SMART, STORM DRAIN STENCILING, RAIN BARRELS, STREAM CLEAN UPS AND MORE. THAT’S ECOLOGY ACTION CENTER DOT ORG...OR CALL 454-3169. “
Website Content

Stormwater Education

To get involved in upcoming clean water events - click here!

To get involved in local planning processes affecting watersheds go to:
- East Side Highway Corridor Study
- Lake Bloomington Watershed Management Planning

Stormwater

Sources
Stormwater comes from rain and anything else that the rain carries along with it when it runs along the ground. This water is usually only filtered by large objects and ends up entering the lakes, streams, and other bodies of water in this relatively unfiltered state. It affects not only the home of many aquatic animals, but your own drinking and bathing water as well.

What is Point-Source and Non-Point Source Pollution?
Stormwater can include water from both point-sources and non-point sources. Point-source locations can create such pollutants as chemical rainout, oil leaks, sewage and build-up. Non-point sources cause pollution from car fluid leaks, fertilizers from farms, pesticides from gardens, paint if dumped into the sinker, and excess plant nutrients.
Proper Waste & HHW Disposal

- HHW events
- Recycling Information Center
Targeting Diverse Audiences

- Spanish language materials, web pages, radio spots
- Church newsletters, bulletin boards
CONTACT INFORMATION

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Fax: 309-454-7508
Illinois Rural Stream Stabilization and Enhancement
Don Rosenboom
U.S. Geological Survey

Alternative and Costs of Reducing Agricultural Nutrient Losses to Surface Water
Dennis McKenna
Illinois Department of Agriculture

Advancements in Agricultural Technology Associated with Precision Farming
Doug Thompson
Lincoln Land Community College and Farmer

Presentation Notes
Rural streams contain the majority of Illinois stream miles (≈ 40,000) – Stream condition determines the amount of sediment and nutrients delivered to the Illinois, Mississippi, Ohio Rivers.

Stream rehabilitation can address multiple water quality problems – erosion, sedimentation, nutrient reduction, instream habitat.

An inventory of stream projects from Southern Illinois to NE Illinois.

Funded by Illinois EPA and Illinois Department of Agriculture.
Current Stream Projects

@ 90 percent of stream projects since 2000 do not require repairs

Mackinaw River 2008

Clear Creek 2008

IDOA bank stabilization for less than federal feasibility study

Stream Barbs
Illinois Department of Agriculture, with IEPA 319 funding
Stream barbs decrease bank erosion and increase instream habitat.

In heavy bedload streams.

Kickapoo Creek
Eastern Illinois
Illinois Dept of Agriculture

Four barbs

2008
Big Creek, IDOA- IDNR Southern Illinois, 2008

Rowcrop field protected with two barbs
Floods driving 60 ft trees thru 40 ft channels - increasing bank erosion and testing rock riffles
Jo Davies County, NW Illinois

Illinois Department of Agriculture

Sinsinawa River

Little Minominee River

2008
Blue Heron Creek – IDNR –
South Kishwaukee River
old wetland
agriculture

2008
Newbury rock riffles increased habitat diversity without increasing instability.

Same reach of Hurricane Creek without riffles.

BUT ---
Shaw Creek - 2004 – small stream outwash on to Fox River floodplain
High erosion potential – tough to stabilize
Incomplete applications of BMP’s

Widen floodway and revegetate with native plants and geotextiles
Limited rock grade controls

However 90% of all stream projects were stable.
Illinois streams run off altered watersheds into channelized ditches in floodplains of larger rivers - Judy’s Branch, Crow Creek, etc.
Utilizing both bank-rod data and resurveyed cross-section data, it was determined that approximately half of the suspended-sediment yield at Route 157 during July 2006-June 2004 came from bank retreat.

Tim Straub measures bank erosion rates
Many trees are undercut – increased scour 
- common in unstable channels 
Floods force 60 ft trees thru 40 ft channels
Past Projects – 1990s
The problem of vegetation in such unstable streams

Richland Creek - Willow Posts - IDNR funding
Richland Creek
Crow Creek

Most willow post BMPs in severe erosion sites eroded out in the 1990s

Usually undercut root zone

Four staff standing on stream bed
Crow Creek 1989-2001

2 days later
Repair of piers
Atlanta’s Robin Sotir’s 1990 bank stabilization with live booms – mounds of compacted soil layers between layers of willow fascines. Mounds are covered with hand-placed riprap and willow stakes.

Live booms after major 1991 flood, which blew out downstream bridge.
Crow Creek 2008

When point bar vegetated. Sand deposition raised bar 6 ft

Boom being undercut

4 of 12 booms undercut – No grade control

remains of boom 2008

1998
Large Sediment Basin – trapped 90% of sediment from Blue Creek

Blue Creek – IEPA - Lake Pittsfield

Illinois EPA guidelines for comprehensive watershed approach –

1980 agricultural BMPs and land use conversion from agriculture to pasture and shrub lands reduced erosion BUT WERE NOT ENOUGH

Extend life of large sediment basin with small basins in watershed

Control larger sediment sources near lake

Large Sediment Basin – trapped 90% of sediment from Blue Creek
Channel incision into sandy loam bank failure

NRCS also considered channel erosion in Blue Creek and installed rock riffles.

Note leaning tree in following slides.
Maintaining deep pools dampens floodwater velocity - even the 2001 100 yr flood

<table>
<thead>
<tr>
<th>Year</th>
<th>Treatment</th>
<th>Nitrogen Load</th>
<th>Nitrogen Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993-1996</td>
<td>No treatment</td>
<td>1.0 tons/ac/yr</td>
<td>3,411 mg/l ave.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.3 tons/ac/yr</td>
<td>6,757 mg/l ave.</td>
</tr>
<tr>
<td>1996-1998</td>
<td>Ponds and dams</td>
<td>1.6 tons/ac/yr</td>
<td>5,655 mg/l ave.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7 tons/ac/yr</td>
<td>4,835 mg/l ave.</td>
</tr>
<tr>
<td>1999-2001</td>
<td>Rock weirs</td>
<td>0.2 tons/ac/yr</td>
<td>1,300 mg/l ave.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7 tons/ac/yr</td>
<td>1,550 mg/l ave.</td>
</tr>
</tbody>
</table>
Installed riffles after flood discharges from Wonder Lake increased channel erosion in meanders
Dr. Richard Schultz
Iowa State, Ames, IA

12 year study of Bear Creek
Riparian buffers - wetlands

Future design of rural stream projects ??
Include nutrient reduction, riparian wetlands, habitat

Added rock riffles to reduce erosion of buffers and bank
Weirs spaced about 300 ft apart. Total length of one weir about 75 ft.
Bear Creek rock riffles after 3 inch rain
Dr Dick Schultz in Bear Creek during Iowa Trees Forever workshop

Stream velocity will scour pool deeper and maintain sediment transport since energy line is not decreased
The Grove Stream and Wetlands - IEPA
Slow flood flow, increase nutrient uptake, Stabilize channel, limit floodplain deposition

Phase I Restoration

Phase 2 Restoration

Phase 3 Restoration

Rock riffles

wetlands

Phase I Restoration
Kickapoo Creek  2008 – IEPA and IDNR funding - in Phase 2 construction - slow floodwaters and maximize contact with emergent plants in the floodplain wetlands and wide riparian buffers

The “IOWA” plan – create larger wetlands but trap less sediment
Establish native prairie and wetland species
Phase 2 Restoration

4600 ft of stream
And 6 wetlands
Alternatives and Costs of Reducing Agricultural Nutrient Losses to Surface Water

Dennis McKenna

Illinois Department of Agriculture
Illinois

- 13 million people
- 28 million acres of agricultural land
- 10 million acres tile drained
USGS says Illinois #1 source of nitrogen and phosphorus to the Gulf of Mexico
Total Nitrogen

Yield (kg km\(^{-2}\) yr\(^{-1}\))

- < 1
- 1 to 10
- 10 to 100
- 100 to 500
- 500 to 1000
- > 1000
Total Phosphorus

Yield (kg km\(^{-2}\) yr\(^{-1}\))
- < 0.1
- 0.1 to 1
- 1 to 10
- 10 to 50
- 50 to 100
- > 100
• USEPA SAB says 45% reduction in both N and P needed to reduce size of hypoxic zone to 5,000 sq km
What can we do in agriculture?

• given,
  – it is not typically over-fertilization based on current rates and yields
  – may be zero or negative N & P balances in some tile drained areas
Nutrients in Illinois

- Mass-balance analysis for Illinois shows negative balance for P and declining balance for N
Illinois P Budget

Mark David, UIUC
Illinois N Budget

Mark David, UIUC

Nitrogen (kg N ha⁻¹)

- Fertilizer
- Legume N
- Deposition
- Grain harvest
- Manure
- Net Nitrogen Inputs

Trends over time from 1950 to 2010.

10
What can we do in agriculture?

three types of conservation practices could help
- nutrient-use efficiency
- in-field management
- off-site measures
Spring nitrate loss from tile drained fields

- improved N fertilizer management
- cover crops, wetlands, drainage management
- alternative and more complex cropping systems (including perennials)
  - cellulosic biofuels (switchgrass, Miscanthus)
Phosphorus loss reduction

• improved P fertilizer and manure management
  – incorporate P fertilizers, manure
  – soil tests, follow recommendations
• riparian buffer strips
• cover crops
• again, alternative and more complex cropping systems (including perennials)
Costs

Practice effectiveness

Cost effectiveness

Cost per pound and

Total cost
Lake Bloomington Watershed
Mark David, Gregory McIsaac and Corey Mitchell
University of Illinois-NRES

Baseline conditions

44,764 acres
93% cropland
Low erosion rates
More than 50% tile-drained
Well-buffered
Estimated Lake Bloomington Loadings

Total P loading – 14,100 lbs P yr-1  (0.31 lb/ac)

Total N loading – 917,000 lbs N yr-1 (21 lb/ac)
# Nitrogen reduction practices (tile drainage)

<table>
<thead>
<tr>
<th>Practice</th>
<th>% reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>nitrification inhibitors</td>
<td>10</td>
</tr>
<tr>
<td>spring vs. fall fertilization</td>
<td>20</td>
</tr>
<tr>
<td>recommended rate vs. above</td>
<td>0</td>
</tr>
<tr>
<td>no-till vs. conventional</td>
<td>0</td>
</tr>
<tr>
<td>cover crops</td>
<td>25</td>
</tr>
<tr>
<td>water table management</td>
<td>40</td>
</tr>
<tr>
<td>shallow or wide tiles</td>
<td>25</td>
</tr>
<tr>
<td>conversion to CRP</td>
<td>95</td>
</tr>
<tr>
<td>conversion to perennial crops</td>
<td>80</td>
</tr>
<tr>
<td>constructed wetlands (20:1)</td>
<td>50</td>
</tr>
<tr>
<td>bioreactors</td>
<td>No data</td>
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## Phosphorus reduction practices

<table>
<thead>
<tr>
<th>Practice</th>
<th>% reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tiled</td>
</tr>
<tr>
<td>recommended rate vs. above</td>
<td>5</td>
</tr>
<tr>
<td>inject phosphorus fertilizer</td>
<td>20</td>
</tr>
<tr>
<td>cover crops</td>
<td>5</td>
</tr>
<tr>
<td>shallow or wide tiles</td>
<td>+</td>
</tr>
<tr>
<td>conversion to CRP</td>
<td>50</td>
</tr>
<tr>
<td>conversion to perennial crops</td>
<td>50</td>
</tr>
<tr>
<td>WASCOBs</td>
<td></td>
</tr>
<tr>
<td>sedimentation basin</td>
<td></td>
</tr>
<tr>
<td>riparian buffers</td>
<td></td>
</tr>
<tr>
<td>constructed wetlands (20:1)</td>
<td></td>
</tr>
<tr>
<td>Practice</td>
<td>Cost</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Fall to spring fertilizer N</td>
<td>$25/ac</td>
</tr>
<tr>
<td>Recommended P rate vs. above</td>
<td>$12/ac/4 yrs</td>
</tr>
<tr>
<td>Inject P fertilizer</td>
<td>$14/ac/2 yrs</td>
</tr>
<tr>
<td>Wetlands</td>
<td>$6,000/ac + $300/ac rent</td>
</tr>
<tr>
<td>Drainage mgt</td>
<td>$250/ac</td>
</tr>
<tr>
<td>Cover Crops</td>
<td>$50/ac</td>
</tr>
<tr>
<td>CRP/perennials</td>
<td>$300/ac/yr</td>
</tr>
<tr>
<td>Practice</td>
<td>Non-targeted Annual cost/lb</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>CRP</td>
<td>$15.60</td>
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<tr>
<td>Fall to spring fertilizer</td>
<td>$3.59</td>
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<tr>
<td>Cover Crops</td>
<td>$15.79</td>
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<tr>
<td>Wetlands</td>
<td>$4.03</td>
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<tr>
<td>Drainage mgt</td>
<td>$3.17</td>
</tr>
</tbody>
</table>
To achieve a 45% reduction in TP

<table>
<thead>
<tr>
<th>Practice</th>
<th>Annual cost/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>No P fertilizer &gt; 70</td>
<td>$193.01</td>
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<tr>
<td>Inject P</td>
<td>$114.62</td>
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<tr>
<td>Perennial crops</td>
<td>$1,013.00</td>
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## Dual nutrient scenarios

<table>
<thead>
<tr>
<th>Percent reductions</th>
<th>Total cost (30 years)</th>
<th>Annual cost per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TN</td>
<td>TP</td>
</tr>
<tr>
<td>Targeted N</td>
<td>50%</td>
<td>52%</td>
</tr>
<tr>
<td>Non-targeted</td>
<td>50%</td>
<td>52%</td>
</tr>
<tr>
<td>TMDL</td>
<td>79%</td>
<td>93%</td>
</tr>
</tbody>
</table>
10 million acres of tile-drained cropland in Illinois x $56 to $94/acre = $560 million to $940 million per year
Conclusions

• current recommendations and BMP’s won’t fix problem

• there are methods that can help, both on- and off-field
  – costs and risk

• no “one size fits all” method

• other benefits (local water quality) may not always be clear
<table>
<thead>
<tr>
<th>Practice</th>
<th>Erosion/runoff</th>
<th>Phosphorus</th>
<th>Nitrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>No till</td>
<td>![Down Arrow]</td>
<td>![Down Arrow]</td>
<td>![Up Arrow] ![Double Arrow]</td>
</tr>
<tr>
<td>Drainage management</td>
<td>![Up Arrow]</td>
<td>![Up Arrow]</td>
<td>![Down Arrow]</td>
</tr>
<tr>
<td>Tile drainage</td>
<td>![Down Arrow]</td>
<td>![Down Arrow]</td>
<td>![Up Arrow]</td>
</tr>
<tr>
<td>Cellulosic crops</td>
<td>![Down Arrow]</td>
<td>![Down Arrow]</td>
<td>![Down Arrow]</td>
</tr>
</tbody>
</table>

**No magic bullets**

- Practice: No till, Drainage management, Tile drainage, Cellulosic crops
- Erosion/runoff: Down Arrow
- Phosphorus: Down Arrow, Up Arrow
- Nitrate: Up Arrow, Double Arrow, Down Arrow
Advancements in Agricultural Technology Associated with Precision Farming

Doug Thompson
2555 1700th Ave
Atlanta, IL 61723
dtfarm@hotmail.com
• Definition:
Application of crop management techniques that measure, analyze and adjust for variability within a field.
You may have navigated to this meeting using GPS!
"Flat, black 160 acres."

For years, every part of the field was treated the same.

Variability:
Not all parts of the field are the same.
Topographical Map

- Not truly “flat”.
- Fall from high (light blue) to low (yellow) spots is 19 feet.
- Average slope 1%.
Soils Map

5 Soil Types – each with different:

- Productivity
- Slope
- Drainage
- Fertility - ??
- Organic matter
Yield Map

Corn yield map
Red - lower yield
Green - higher yield

Yields can vary greatly due to:
• Soil
• Fertility
• Drainage
• Compaction
• Pests / disease
Grid Map

Was farmed as a 160 acre field.
Now farmed as 55 ~ 3 acre fields.
Each grid - separate:
• Soil fertility tests
• Yield history
• Variety history
Grid Yield Maps

Can use this data to generate fertilizer application rates that replace only the fertility removed by the crop.

* This map shows corn yields from 2 years.
Variable Fertilizer Rates

Phosphate application

Limestone prescription
A Friend’s Field . . .

Irrigated field yield goal:
Less water = less yield

Nitrogen fertilizer rate set by soil type & water application
Farming Technology - Today

Strip till farming - benefits:

- Disturbs only small area of soil – reduced erosion
- Controlled traffic
- Less energy required
- Conserves moisture
- Places fertilizer near seed & roots
- Faster growth
Farming Technology - Today

Strip till Challenges:

- Fall fertilizing time can be limited
- Difficult to see strips in the spring
- Accurate placement of seed required
- Challenge to rotate strip location
**RTK AutoSteer to the Rescue**

Automatic steering by GPS
Requires base station
Accuracy +/- 1”

Repeatable year to year
Adjusts for tractor tilt
But, pretty expensive
Autosteer – making strips
Desired Result
Planting Accuracy

Also follows curved rows.
Impress Neighbors – straight rows
Works at Harvest Too
Farmers Like RTK Autosteer

- Reduces fatigue
- Can pay attention to equipment
- Increased efficiency
- Flexible start/stop points
- Match equipment of differing widths
- Works in dusty, dark conditions
- Frees time to manage, communicate
Other Technologies - Today

Crop Sensors:
- senses crop color
- adjusts fertilizer rate

Section Control:
- Turns on/off rows automatically
- Reduces seed/chemical use & cost
Technology – The Future

- Even more precise equipment control
- Real time soil sensors – fertility, moisture
- Sub surface irrigation
  - very efficient water use
  - autosteer avoids damage to pipes
- Detailed data collection
- Real time data transfer & analysis
Large or Small? – or Both

World’s largest planter – 120’ wide

Robot fleet – planting, weeding
Questions?

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Thanks to Allen Sasse, Mike Toohill, Charles Taylor, UniBots.com and numerous manufacturers for providing several of the pictures you’ve seen here! Thanks also to the many innovators that have paved the way for these methods and technologies.
End of Presentation - maybe
Hard Day Planting Corn

The actions portrayed in this video are not in any way endorsed or supported by the John Deere Company!
Good afternoon. Yes, I’m a farmer from NE Logan County and straight off the combine. I’m also hoping that my dad and wife are keeping things running back home ahead of the rain predicted for tonight and the next couple of days.

My talk will address how Technology is being used in the application of Precision Farming methods – most of this will be from the perspective of how they are used in my farming operation – though I will touch on some other examples, as well.

Perhaps we should start by defining **Precision Farming**. I call it:

**SLIDE 2** *The Application of crop management techniques that measure, analyze and adjust for variability within a field.*

The key here is variability. Our fields are not all the same and it’s important that we manage them in ways that account for those differences. This is important to you and me because it ends up protecting the environment (including our river system). It’s additionally important to me, because it saves me money.

Two technologies – neither developed especially for agriculture – have made precision farming possible – Computers & GPS

- **Computers** have allowed us to collect and analyze data and then develop and apply plans that address the variability within our fields
- **GPS** has been the primary tool that has made it possible to associate this data with specific locations in the field and thus giving us information about where to make adjustments.

**SLIDE 3** Many of you are quite familiar with GPS applications. Your cell phone is probably equipped with it and perhaps you used one of these to find your way to this meeting!

**Let me give you an example of how this GPS and computer technology has transformed how we view and manage one of my fields.**

**SLIDE 4** This field is a half-mile square 160 acres. It’s what is often referred to as a “Flat, black 160 acres”. The field was, for many years, managed as a unit. Fertilizer was applied based on an average of maybe a dozen soil samples taken from the field. We knew that variability existed in the field, but we had no way to manage that.

**SLIDE 5** The GPS data that we collect also records elevation, so I’m able to create topographic maps like this. Notice the high spots (in white and blue) and low spots (in yellow) in the field. We use this information to visualize how water drains off the field. But I show it to point out that this field is by no means “flat”. From the high to low point is fall of 19 feet.
Thanks to our county and the NRCS, we now have digitized soil maps available. Each color here represents a different soil type. We can now see that the “black” soils are not all the same. They have different:

- Productivity (yield potential)
- Slope
- Drainage ability
- Natural fertility
- Organic matter
- other qualities

Our combine is equipped with a yield monitor that logs the yield every few seconds by GPS location. With this data, we can create yield maps that easily identify the high and low yielding areas of the field. This example shows the 2007 corn yield - Red = low, Green = high. Of course, these maps don’t tell us what caused the variation – soil characteristics, fertility level, drainage problems, compaction, pests, diseases, etc. – only where the differences exist.

One way of handling variation is to create management zones – here shown as grids. We have taken our original 160 acre field and divided it into 55 fields, of about 3 acres each. We collect data for each of them, which we then use to manage those areas uniquely. We currently have soil fertility tests, yield data and variety data for each grid.

Here’s an example of the corn yields averaged within each of the grids. One use of this information might be to calculate the fertility removed by the crop, so the amount applied would only replace that amount removed. This avoids over-application for environment and economic benefits.

I have applied my own fertilizer, using variable rate application, since 1996. Soil tests taken in each of those grids, identify the fertility levels and I apply only what is needed to maintain or achieve levels recommended by the U of IL. Our fields are naturally high in phosphorus, so this method often results in some areas receiving no application (for several years). This is a map showing the phosphate fertilizer application one year. Notice the red areas showing 0. This again reduces the phosphorus load on the rivers and is friendly to my pocket book.

I also use this data to generate prescriptions for my fertilizer dealer for the application of limestone on the field. Again, red is zero application.

Deviating from information about my own farm – I have a friend who farms some irrigated fields along the Sangamon and Illinois rivers in Cass County. In a normal year (not 2009) he would expect the irrigated area of his field to yield more than those outside the circles. So in calculating his nitrogen application rate, he assigns different yield goals to the 2 areas. He also adjusts for the soil types on the field and applies to each part of the field what should be adequate, but not excessive amounts of nitrogen.

One of the more exciting technologies being used on the farm now is autosteer. I want to show how we have used that on our farm.
(SLIDE 12) The tillage methods that we use on our farm are no-till for the soybeans – just as it implies – we plant the soybeans without working up the soil during the year. For corn we use the strip-till system. This involves making one tillage operation in the fall to both apply the nitrogen fertilizer and build a small strip upon which the seed will be planted in the spring.

By only tilling a small strip, we leave most of the soil and crop residue undisturbed and thus resistant to river-clogging erosion. Other benefits are:

- We make fewer trips across the field – saving fuel
- Those trips rarely cross the tilled strip – resulting in less compaction of the soil where the corn grows
- Since we don’t till the soil, the moisture doesn’t evaporate as fast and stays available for the crop
- The fertilizer is placed just beneath where the seed will be planted - making it readily available to the crop
- Also, the small tilled strip is usually drier and 3 – 5 deg. warmer than the surrounding soil – which helps the seed get off to a quick start.

(SLIDE 13) Nothing’s perfect and strip till has its drawbacks:

- Wet fall weather, like this year can leave limited time for the fall fertilizing/strip building. Doing that in the spring may not work many years
- Depending on the winter, it is sometimes difficult to see those strips in the spring. Yet it is necessary to accurately plant the corn on those strips
- Finally, it’s best to move those strips slightly from year to year in order to avoid creating “hot spots”. It is hard to do that accurately by sight.

(SLIDE 14) The solution to these challenges is RTK Autosteering:

- This is automatic control of the tractor’s steering by a GPS guided system
- To achieve the needed accuracy of +/- 1” the GPS needs a stationary reference base station (pictured here). This base sends information to the tractor saying how the GPS location needs to be adjusted in order to gain that exceptional accuracy
- It has the added benefit – since the base station never moves – that the guidance lines set up in a field are always the same year to year
- And – if you have a hilly field, the tractor even adjusts its path for the hillside tilt
- Cost $25 – 30K.

(SLIDE 15) This tractor is set up with the antenna array needed for the RTK accuracy. Antennas on each side of the cab to determine the tilt and direction the tractor is facing. (Click) The display in the tractor is used to set up the straight or curved lines to guide us through the field.

(VIDEO SLIDE 16) Here’s a video I took while applying the NH3 and building the strips for a corn crop following corn.

- Notice the no hands on the wheel – the tractor drives perfectly straight
- We can turn to watch the implement behind, as the tractor continues to do the driving.

(SLIDE 17) All of this is for the purpose of creating a narrow, mellow strip that can be precisely planted upon in the spring.

(SLIDE 18) The corn is planted with a tractor equipped with the same Autosteering system and it really works! (Click) Even curved rows are no problem. Notice the black arrow. This is the row
lying between the 2 passes of the equipment – it’s the same width as all the other rows – very accurate.

(SLIDE 19) Another benefit - we farmers enjoy impressing our neighbors and landlords with perfectly straight rows.

(SLIDE 20) I also have equipped my combine with Autosteer. You can see in this video clip the combine take over as it picks up the next guidance line during the turn and it steers right down the row. I really like it for soybean harvest, because the Autosteer ensures that the combine is always taking a full width of crop in every pass. This is actually what I’ll be doing in another couple of hours.

(SLIDE 21) These are perhaps side benefits to the Autosteer, but they are significant:
- When they allow your 83 year old father still remain active in planting the crop. You are less tired at the end of the day (able to work longer hours)
- You can watch what you need to instead of where you are going all the time
- You take a full pass each time – being more efficient
- Every pass in the field is established when you set the first pass. So, you can start in the middle of the field and still have that last pass fit perfectly
- Different equipment widths are no problem as the Autosteer can adjust for them
- Visibility is no problem because the Autosteer works after dark and when the dust is blowing
- Finally, we can have time to make management plans and talk on the cell phone or send text messages, without having to give full attention to steering.

(SLIDE 22) A couple of technologies now in use (not by me yet):

Crop sensors, like this, can adjust fertilizer rates based on the apparent health of the plant. Health is sensed by the color reflected off the crop. It may save fertilizer by only applying the amount that the crop actually needs, rather than some estimate made before the crop was even planted.

(Click) Section Control is becoming popular due to the high cost of inputs. With seed nearing $400/bag ($175/ac) we don’t want to double plant on the ends of fields like we used to. In this picture, the planter rows are shut off 2 at a time and this is all done automatically. The planter control knows – not only where each pair of rows is at all times, but also knows what parts of the field are already planted. It doesn’t let the 2 overlap any significant amount. The same technology is used on sprayers to avoid overlap (or double application) in any part of the field. Again – this is good for the environment and the checkbook.

(SLIDE 23) How will technology impact farming in the future? My predictions:
- Equipment will continue to increase in the use of GPS and computerized controllers to precisely apply inputs and monitor field activities.
- Sensors will measure soil and crop characteristics on the go to adjust for weeds, fertility levels, insects, moisture – so that we don’t apply products unless needed.
- We may irrigate by underground pipes that avoid evaporation and that are not damaged by tillage since the autosteer system knows where they are.
- We’ll collect mountains of data about our crops – both for regulatory purposes and to make wise management decisions.
• That data will be moved directly from the tractor to the office and used for cost analysis and agronomic purposes (done now).

(SLIDE 24) This is currently the world’s largest planter – 120’ wide (3X mine). It will be capable of keeping track of when and where every seed is placed – and what products were applied with it.

(Click) Likewise, we may farm with robots. They may:
• do the planting – logging the same information as the big planter
• do the weeding (on a micro level – weed at a time) using small amounts of chemicals
• do the crop scouting – for weeds, insects, soil analysis

There’s room for big and small – limited only by our imaginations and ingenuity.

(SLIDE 25) Questions?

(SLIDE 27) Corn planting video – was on Youtube until John Deere requested removal.
• Notice the open door on the tractor – no driver inside!
• Definitely not approved by equipment manufacturers – UNSAFE!
Ecosystem Services: The Economic and Societal Benefits Provided by Healthy Ecosystems

Alternative Land Uses: Emerging Ecosystem Service Markets
Keith Oswald
V3 Consulting

Large River Ecosystem Restoration and Monitoring:
How the Past Paves the Way for the Future on the Upper Mississippi River System
Marvin Hubbell
U.S. Army Corp of Engineers

Farming for Ecosystem Services: Research and Policy to Make it Happen
Scott Swinton
Michigan State University
Alternative Land Use:
Emerging Ecosystem Service Markets

The 2009 Conference on the Management of the Illinois River System

Presented by:
Keith R. Oswald, P.E.
V3 Companies, Ltd.
Using Ecosystem Service Markets to advance Illinois River watershed goals...*where are we now?*

The state of domestic Ecosystem Service Markets...*encouraging developments*

Should we promote broad-based ES market development in Illinois...*where do we go from here?*
Alternative Land Use?
- 100 years of “traditional” development within the Illinois River watershed with little economic value placed on its natural capital
- Result…few market incentives for the conservation and restoration of ecosystems

*With declining supply of Ecosystem Services, this is beginning to change…emerging ES markets may provide land owners an “alternative” to traditional land use.*

Typical (not always common) ES Market Opportunities
- Carbon sequestration
- Wetlands mitigation banking
- Flood mitigation
- Water quality trading
- Conservation banking / biodiversity offsets
- Water rights
- Water temperature offsets
- Transferable development rights
What role can ES Markets play within the Illinois River watershed?

**Corporate Lands / Surplus Properties**

- Underutilized corporate lands offer…
  - Ecological reuse
  - Connections - biodiversity / wildlife corridors
- Private sector is ready…but we need additional catalysts

*Integrated, multi-credit ES Markets?*
How might ES Markets help within the Illinois River watershed?

**Rural / Agricultural Lands**

*Nutrient reduction…carbon sequestration…flood mitigation…wetland mitigation…biodiversity…*

- Another means of conservation finance or landowner returns?
- Where might stacking of multiple credits be appropriate?
  - May be key to effective financial incentives

**Broad-based ES markets that complement public incentives?**
Where are we now?

- **Wetland mitigation banking market**
  - Robust / mature => Illinois has been a leader
  - Demand is fragmented / concentrated
  - Banking rule was a positive development

- **Voluntary carbon market**
  - Increased demand in anticipation of Cap & Trade
  - At present a very limited market, with very low pricing

- **Virtually no water quality trading**
  - Limited bilateral trades
  - Early feasibility efforts beginning in several watersheds

- **Conservation banking / biodiversity offsets**
  - Some voluntary biodiversity transactions

*Currently ES Markets are single-purpose...fragmented (regulatory and geographic)...often lack obvious demand...and can be high risk (buyers and sellers).*
• **Private Sector Momentum**
  Corporate Social Responsibility / Sustainability

• **Federal Policy**
  USDA, Office of Ecosystem Services and Markets

• **Carbon Markets**
  – Voluntary carbon markets / retail offsets
  – Pending Cap & Trade legislation

• **Market Infrastructure**
  Environmental Exchanges & Registries
Emerging ES Markets... state / regional efforts

- **Oregon Senate Bill 513**
  State policy to support ES market

- **Willamette Partnership**
  Integrated ES marketplace

- **Bonneville Environmental Foundation**
  Moving beyond carbon... the first voluntary water restoration market!

- **Ohio River Basin Trading Program**
  Interstate nutrient / GHG reduction
Is there a case for robust ES Markets in Illinois?

Can we develop integrated, multi-credit ES markets in Illinois...that promote strategic restoration and conservation?

- **Regulatory drivers on the horizon?**
  - Water quality trading – will meaningful drivers materialize?
    - Nutrient Standards
    - TMDLs – implementation?
    - Gulf Hypoxia
  - Carbon offsets – cap and trade?

- **Corporate Social Responsibility (Sustainability) / Public Sentiment**
  - Real and significant trend...will have a large role in shaping the future
  - Expanding voluntary markets
    - Retail carbon
    - Biodiversity
    - Water quality / consumption
  - Climate change & carbon market development...conversation and efforts have provided tremendous value by educating and increasing awareness

- **The Future?**
  - Holistic water markets – consumption (waste) and quality?
  - Biodiversity offsets?
  - Flood mitigation?
  - More significant voluntary and incentive-based actions?
How can we (should we) promote a comprehensive ES Market in Illinois...in the Illinois River watershed?

**Backdrop**

- **Illinois River Integrated Management Plan**
  - framework for grassroots advocacy, education and innovation
  - maintains a commitment to voluntary incentive-based actions…
  - steers away from over-reliance on command and control solutions

- **Integrated, multi-credit (holistic) ES markets**
  - compatible with the Integrated Management Plan, but…
  - *markets must be sustainable…must provide real benefit*
  - Enable strategic, outcomes-based actions …within the watershed
  - Provide businesses and landowners within the watershed opportunities for more significant local stewardship and community contributions …increases ability to leverage CSR / Sustainability for local benefit
Key Question

- Should Illinois and watershed stakeholders take a proactive role in promoting the development of integrated and holistic ES markets (now)?
- …or, wait to see if (how) regulatory drivers materialize?

How can we (should we) promote a comprehensive ES Market in Illinois...in the Illinois River watershed?
Questions or Comments?

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Large River Ecosystem Restoration and Monitoring: How the Past Paves a Way for the Future on the Upper Mississippi River System

October 21, 2009
Peoria, IL

By
Marvin E. Hubbell
Marvin.E.Hubbell@USACE.Army.Mil
http://www.mvr.usace.army.mil/EMP

One Team: Relevant, Ready, Responsive and Reliable
Looking Back – Looking Forward
UMRS

1870 - Managed System (4-Foot Channel)
1940 - UMR-IWW 9-Foot Channel Project
1950 to Present - Environmental Degradation
1986 - EMP Authorized and
Vision for Multiuse System
2007 - NESP Authorized
National Significance of
Upper Mississippi River System

Only River in the United States to be formally recognized by Congress “… as a nationally significant ecosystem and a nationally significant commercial navigation system. … shall be administered and regulated in recognition of its several purposes.”

Citation: Water Resources Development Act of 1986, Section 1103(a)(2).
UMR-IWW NAVIGATION SYSTEM

- Significant Ecosystem (2.7 million acres)
- 30 Million People
- 1,200 Miles of River
- 37 Lock Sites
  Constructed 1930-45
Lower Pool 16 ca. 1943
One Team: Relevant, Ready, Responsive and Reliable
Degradation of Habitat

- In the Impound Reaches - greatest impact in the Lower 30% - 50% of Pools
  - Loss of Topographic Diversity
    - Sedimentation of deep areas
    - Erosion of Islands
  - Higher water levels at historical low flow periods negatively impacted moist soil plants
  - Higher water table negatively impacted floodplain forests
Degradation of Habitat

In the Open River reach this resulted in a narrowing and deepening of the main channel and reduction of habitat complexity.
EMP Timeline

- Upper Mississippi River Basin Association (1981 – Present)
- WRDA 1986 – EMP 1st. Large Scale Ecosystem Restoration and Monitoring Program In Corps, Nation, and World.
COLLABORATION

One Team: Relevant, Ready, Responsive and Reliable

PUBLIC

NGO’s
Major Components of EMP

HREP
50 Projects
83,000 ac.

Sunfish Lake, Pool 11
Aug. 1994

Sunfish Lake, Pool 11
Sept. 2006

One Team: Relevant, Ready, Responsive and Reliable
One Team: Relevant, Ready, Responsive and Reliable

FISHERIES

WATER QUALITY

VEGETATION

SPATIAL ANALYSIS (GIS)
Key Regional Features

- Partnership – Not just a concept but a way of doing business.
- Development of a regional Corps business model
- Linkage between understanding the ecology of the UMRS with restoration efforts of the UMRS.
- Adapt and develop restoration and monitoring techniques for use on a large river system.
- $33.4 M Authorization
While EMP was growing up
NESP was being conceived
and then born!
NESP Timeline

2. 1993 Navigation Feasibility Study
3. 2000 – 2004 Feasibility Study added Ecosystem Restoration (to compliment EMP)
4. 2007 WRDA Dual Purpose Authorization of First Increment - $1.8 B Authorization
Key Lessons

- Partnership – Hallmark of EMP
  - Basis of technical, policy, and political support and development of program.
  - One of 3 – 6 national priority projects since 2001

- But…
  - You can always improve
    - More formal engagement of NGO’s and other stakeholders
    - More formal involvement of higher level management
Key Lessons (cont.)

Effective Integration of ecosystem restoration and scientific monitoring and research is critical to success. Another Hallmark of EMP.

- Monitoring Status and Trends of UMRS
- Research
- Systemic Data Acquisition
- Monitoring Project Performance
- Passive Adaptive Management Strategy
- But …
Key Lessons (cont.)

- Under NESP we will develop –
  - Strategy for Active Adaptive Management
  - Expand project monitoring efforts
Key Lessons (cont.)

- Importance of learning and transfer of knowledge. Last two decades:
  - Planning Manual
  - HREP Design Manual
  - More than 300 reports and scientific publications
  - Integrated technical and policy teams
  - Quarterly Meetings
  - Data Bases and web sites
  - Public Out Reach
  - But …
The future demands increasing levels of effort and investment in all of these areas. Especially:

- DSS
- Regional Public Outreach
- “Program Neutral” Communications
- Expansion of electronic communication and direct contact.
- Increased use of models
Key Lessons (cont.)

Transparency, Accountability and Sophistication must increase over time. Anticipate it, plan for it, and budget for it.

– Evolution of project identification and selection:
  - Initial projects – Project based perspective
  - 2nd Generation – Greater transparency, local, reach, and systemic perspective.
  - 3rd Generation – Linkage to “codified” goals and objectives with the development of indicators to measure progress.
Conclusion

- **Adaptive Management**
  - EMP – Passive
  - NESP - Active

- **Ecosystem Restoration relationship to the inland navigation system**
  - EMP – Linked
  - NESP – Tied

- **Funding**
  - EMP - $33.2 M Annual - $500 M over 15 yrs.
  - NESP - $1.8 B first increment

- **Congressional Intent for EMP & NESP**
  - Linked, Tied, and Integrated
Farming for Ecosystem Services: Research and Policy to Make it Happen

Scott M. Swinton
Michigan State University

Agriculture as managed ecosystem

- Agriculture is humankind's oldest and largest engineered ecosystem
Agriculture has optimized nature for food, fuel & fiber production

- Genetics optimized for marketable products
  - Plant architecture for higher biomass in grain
  - Animals for leanness, bigger shares of desired cuts
- Agrochemical innovations have allowed timely, low-cost delivery of needed inputs
- Mechanical innovations allow few people to farm
  - Large crop areas
  - Large livestock herds
But does agriculture provide the array of ecosystem services we would like?

- “Ecosystem services are the benefits that people obtain from ecosystems.” (Millennium Ecosystem Assessment, 2005, Ecosystems and Human Wellbeing: Synthesis)

Source: Millennium Ecosystem Assessment
Ecosystem service flows to and from agriculture

**Services TO**
- Climate/air regulation
- Water provision
- Soil provision
- Pollination
- Pest regulation
- Genetic diversity

**Services FROM**
- Food & fiber
- Aesthetics
- Recreation
- Carbon sequestration
- Biodiversity conservation

**Disservices TO**
- Pests & diseases

**Disservices FROM**
- Water pollution
- Health risks from agrochemicals
- Greenhouse gasses
- Wildlife habitat loss
- Aesthetics of big farms

*Swinton et al, Ecol Econ 2007*
But if we design it, will it fit farmer goals?

<table>
<thead>
<tr>
<th>Ecosystem services UP ↑</th>
<th>Farm profit UP ↑</th>
<th>Farm Profit DOWN ↓</th>
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<tbody>
<tr>
<td></td>
<td>Win-win</td>
<td>Trade-off</td>
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Win-win Opportunities

- Targeting inputs in time & space
  - Examples:
    - Fertilization - Just-in-time and site-specific
    - Threshold-based pest control (IPM econ threshold)
    - Plant breeding to fit ecosystem niches
  - Effects
    - Boosts production of food, fiber, fuel
    - Cuts wastes – water pollution, N₂O emissions
- Optimize natural services to agriculture
No-till cropping can cut greenhouse gas emissions while being profitable.
Trade-offs: When environmental benefits come at a cost

- Direct costs …
  - Example: Cover crop seed & planting for reduced erosion & N loss

- Opportunity costs from reduced income …
  - Setting aside productive land for wildlife habitat
  - Giving up crop yield by lowering N fertilizer rates to cut N\textsubscript{2}O emissions
Habitat managed for biological pest control

- Soybean aphid = new pest that cuts yields
- Asian lady beetle is predator

Photos: Christine DiFonzo, MSU
Measuring value of soybean aphid biocontrol

Soybean price: 2007-08 USDA price projection $380 Mg⁻¹ = $10.40 Bu⁻¹

(Landis, Gardiner, van der Werf, and Swinton, PNAS, 2008)
Farm focus groups & survey: Global warming seen as less important “to Me” than “to Society”

- Reducing global warming
- Reducing pesticide risks to humans
- Reducing P runoff
- Reducing N leaching
- Increasing soil conservation
- Increasing soil organic matter

“The To Me” Relative Importance “To Society”
Costs to farmers of providing environmental benefits in 2008 survey of Mich corn-soy growers: 2 options

- A: Corn-soybean
  - Reduced tillage
  - Nitrogen fertilizer just-in-time based on tests

- D: Corn-soybean-wheat
  - Reduced tillage
  - Nitrogen fertilizer just-in-time based on tests
  - Winter cover crop
  - 1/3 cut in fertilizers by applying only over row
Added costs compared to typical corn-soybean production

**Crop system D**
- D: Corn-soybean-wheat
  - Reduced tillage
  - Nitrogen fertilizer just-in-time based on tests
  - Winter cover crop
  - 1/3 cut in fertilizers by applying only over row

**Added costs**
- Wheat often lower revenue than corn-soy
- OK
- Soil testing during season causes delays
- Costly seed & labor
- Equipment to “band apply” fertilizers
Payment for Environmental Services: Farmer willingness to change

• If a program run by the federal government would pay you $X per acre each year for 5 years for using this cropping system, would you enroll in this program? (Yes) (No)

• If Yes, how many acres would you enroll in this program? _________

Farmers at focus group, 2007
Small changes cost less to supply, so more land offered

![Graph showing the cost of various crop rotations and soil tests over acreage enrollment. The graph includes lines for Corn-soy-wheat, Cover crop, N-test, and Corn-soy N soil test.]
Large farms offer more acreage
To cultivate ecosystem services:
Understand the cultivators, Create incentives

- Farming can supply enhanced ecosystem services
- Farming is both *life style* and *livelihood*
  - Environmental stewardship matters
  - Income matters too
- Win-win technologies are easy if farmers aware
  - → Educate
- Trade-offs (there are many) require incentives
  - Should farmers bear costs if society benefits?
  - → Payment for environmental services
    - Emerging markets for greenhouse gasses
    - Government programs for soil & water conservation
Acknowledgements

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1800 Michigan farm survey respondents & 39 farm focus group participants. Colleagues Christine Jolejole, Frank Lupi, Phil Robertson, Natalie Rector, Sara Syswerda.
Local Community Action: You Can Do It Too!

Using Social Information to Guide Outreach Activities in the LaMoine River Watershed
Linda Prokopy
Purdue University

Stormwater Utilities: A Source of Funding for Stormwater Management Issues
Mike Hall
Town of Normal, Illinois

How to Protect Shorelines on $25 or Less a Day
Tom Ryan
Lake Sara Foundation
Using Social Information to Guide Outreach Activities in the La Moine River Watershed

Linda Prokopy
Purdue University
October 22, 2009
Develop a system for collecting and using social data to evaluate NPS management efforts in Great Lakes Region/Region 5

Complement existing “administrative” and “environmental” indicators

Partnership with USEPA, state water quality agencies, and land grant universities

Provide assistance & support to state programs and NPS projects
Three Types of Indicators

- Environmental
  - pH, TSS, bacteria, turbidity

- Administrative
  - Bean counting!
  - Number of plans written, number of newsletters distributed

- Social
Improvement & protection of water quality

Program Activities

- Social norms
- Skills
- Attitudes
- Capacity
- Awareness

Use of water quality management Practices

- Constraints
- Values
- Knowledge

Conceptual model
SI Planning and Evaluation Process

SI Step 1: Review project plan
---
SI Step 2: Collect and enter pre-project survey data
---
SI Step 3: Review data and refine social outcomes
---
SI Step 4: Monitor social data throughout project
---
SI Step 5: Collect and enter post-project survey data
---
SI Step 6: Collect and enter additional post-project data
---
SI Step 7: Review data and use results
La Moine River Watershed
Study Design

- Treatment
  - Targeted education

- Business as usual
  - Typical education

- Control
  - No interventions
To gather information on
- Awareness
- Attitudes
- Behavior
- Constraints
Part 1: Review Demographic and Adoption Data

- Does anything stand out about the demographic data from the survey that would influence an outreach and education plan?
- How many people are willing to adopt particular practices?
- What level of awareness is there about each practice?
Part 2: Review Awareness, Attitudes, and Constraints Data

- What interesting patterns do you see?

- What constraints and awareness issues might need to be addressed for behavior to change?

- What attitudes can you take advantage of in crafting your outreach message?
Part 3: Developing a Message

- Outcomes – start with destination in mind!
  - Think about outcomes in terms of changes in awareness, attitudes, constraints, behaviors

- Messages
  - What messages will be effective at reaching members of the target audience?

- Message delivery
  - Who should deliver the message?
  - How should it be delivered?
Observations from La Moine data

- Lack of understanding of problems
- Need for money to implement BMPs
- They have a better relationship with local government than state/national, i.e. like SWCD don’t trust EPA
- People are concerned about high drinking water treatment costs
- Farmers seem to really care about environment
- Need a “we all live downstream” message
Using Social Indicators

- Clearly define environmental problems and the decision-makers ultimately responsible for solving them

- Clearly define linkages between environmental and social outcomes

Diagram:
- Identify Pollutants/Stressors
- Identify Places/Causes
- Select Practices
- Reach People
The 4 P’s for La Moine

- **Pollutants to focus on**
  - Sediment
  - Nutrients
  - Fecal Coliform or E.coli

- **People**
  - Mix of owning and renting
  - Lots of smaller operators
  - Older people are making most of the decisions right now

- **Practices**
  - Managing tile drainage
  - Keeping livestock out of waterways
  - Cover crops
  - Nutrient Management

- **Places**
  - The subwatersheds selected for this study
Example– Keeping livestock out of the streams

*Outcomes:*
- Keep livestock out of stream
- Change attitudes (people don’t want to change what they’ve been doing for years)
- Increase awareness of benefits:
  - aesthetics
  - soil erosion
  - water quality
Conclusions for messaging

- Try 5 different types of messages:
  - This is the traditional way
  - This is easy
  - Be a good steward
  - Herd health
  - Use humor and exaggerate their concerns
Message Delivery

- One-on-one conversations
  - “tell me what your fears are”

- Pasture walk
  - to appeal to aesthetics

- Newsletters/factsheets
Outreach Materials

Cover Crops

Protecting the Soil, Protecting your Investment

What are Cover Crops?
Cover Crops are grown, typically in areas that would otherwise be fallow or where they can be planted after harvesting the main crop. They provide many benefits to the soil and the environment, including:

- Reduced soil erosion
- Improved soil structure
- Nourishment for the ground
- Improvement of water quality
- Increased wildlife habitat

Cover crops help to protect the soil, ensuring better soil quality by adding organic matter. Most organic farmers plant cover crops every year to ensure a good base soil environment during the time when it is not harvested. These crops are especially important for crop rotation practices, which have a wide range of benefits for the land and the farmer.

LA MOINE RIVER ECOSYSTEM PARTNERSHIP

Improved Livestock Management Practices

Helping You and Your Operation

Livestock are a vital part of Illinois agriculture. However, without effective management, livestock can have harmful impacts on water quality. These management practices are key in solving these problems, and there is assistance available to help you implement them.

Removing: Thicker, More Dense Barriers

Many livestock operations can use their animals and their land watersheds. They understand that the impacts of their actions can be significant to people downstream. Sometimes livestock management along a stream or other bodies of water can mean damage. For example:

- Livestock can contaminate waterways, phosporus, and harmful bacteria
- Livestock can cause pollution by leaching nutrients from the soil
- Livestock can contribute to soil erosion by trampling the soil
- Livestock can contribute to soil compaction by trampling the soil
- Livestock can contribute to soil compaction by trampling the soil
- Livestock can contribute to soil compaction by trampling the soil

Managing Tile Drainage

Putting You in Charge of Your Field’s Drainage

Managing tile drainage is important for protecting the environment. The drainage system is designed to remove excess water from the field and prevent water from entering the stream. However, if not managed properly, it can also cause damage to the ecosystem. Therefore, it is crucial to maintain and manage the drainage system effectively.

What does it mean to Manage Tile Drainage?

Managing tile drainage means keeping the flow of water under control. The drainage system is designed to remove excess water from the field and prevent water from entering the stream. However, if not managed properly, it can also cause damage to the ecosystem. Therefore, it is crucial to maintain and manage the drainage system effectively.

Managing Tile Drainage Fact Sheet for Illinois River Basin Partnerships

By managing the drainage, you can help protect water quality, prevent soil erosion, and improve the overall health of the ecosystem. This is especially important in areas where tile drainage is used, as it can help prevent soil erosion and improve water quality.
Field Days

- Collaborated on a crop field day
- Held an ‘Improved livestock management practices’ field day
We will be resurveying in January 2010 to analyze the effectiveness of the tools that were developed for the targeted education.
  ◦ Was there an increase of awareness?
  ◦ Have barriers to adoption been lowered?

We will also be conducting interviews with key informants in the watershed to gather additional information that the survey instrument was not able to capture.
Session C-2
Local Community Actions: You Can Do It Too!

Stormwater Utilities: A Source of Funding For Stormwater Management Issues

Mike Hall, Public Works Director
Email: mhall@normal.org
Stormwater Utility
(5-Step) Program Development

1. Feasibility Study
2. Develop program with Stakeholder Groups
   - Neighborhood Associations
   - Businesses, Organizations
   - Churches
3. Meet with key potential ratepayers
4. Finalize program goals and financing methods
5. Develop and pass Stormwater Utility Ordinance

10/21/2009
Step 1: Utility Feasibility Study

- Kickoff meeting with Town staff to discuss goals and objectives.
- Written summary of financial information (as provided by the Town).
- Staff interviews and written interview summaries.
- Written summary of existing stormwater program issues, needs and problems.
- Written summary of ERU analysis, with example illustrations of GIS mapping with impervious surface calculations.
- Funding Feasibility Study (DRAFT and FINAL)
- Presentation of Study to Town Council.

10/21/2009
Step 2: Stakeholder Involvement

- Advisory Committee Process (SWAC Meetings)
- Determine appropriate program costs (5-year budget)
- Public feedback
- Work with Town Council to establish funding mechanism
- Implement funding mechanism
- Enact stormwater program objectives
SWAC Process

- Storm Water Advisory Committee (SWAC)
  - Recommended by funding feasibility study
  - Consisted of over 20 members
    - Neighbors Association of Normal (NAN)
    - Churches
    - Local businesses
    - Local universities and colleges
    - Schools
    - Town of Normal staff
  - Met 4 times (December 2005 – March 2006)
Advisory Committee (SWAC) Process

- **Draft Policy Paper**
- **Discuss Policy Paper**
- **Agree on Policy Statement**
- **Discuss Policy Statement**
- **Draft Policy Statement**

10/21/2009
SWAC Process: Meeting Topics

A Existing Program

B Problems, Needs Goals

C Program Priorities

D Planned Program

E Funding Methods

F Recommendation

10/21/2009
A: Existing Program
Stormwater Management in Normal

- Site Plan Review
  - Review engineering drawings for new developments
- Planning / Design / Construction
  - Plan / Design regional stormwater management systems
  - Stormwater Master Plan development
  - Design and construction of capital improvements
- Enforcement
  - Site inspection (i.e. erosion control enforcement)
- Administration
  - Town Engineering and Public Works staff
A: Existing Program
Stormwater Management in Normal

- NPDES Phase II (Stormwater) Permit
  - New stormwater regulations (federal mandate)
  - New required activities (Best Management Practices):
    - Public education / public involvement
    - Erosion control
    - Pollution inspection and prevention
    - Post-development stormwater management
    - Changes in operations at municipal facilities
    - New enforcement requirements
  - Recordkeeping and annual reporting
B: Problems, Needs, and Goals

- Proactive approach to stormwater management
  - Protect public safety
    - Reduce flood potential
    - Careful planning for new land development
  - Meet new regulatory requirements
    - NPDES Phase II Permit
  - Keep up with system maintenance needs
    - Repair eroded drainage channels
    - Inlet and catch basin cleaning
  - Focus on environmental sustainability

10/21/2009
B: Problems, Needs, and Goals
SWAC Exercise

- **Part 1:** Identify stormwater issues of importance
  - Round Robin style
  - Issues written on Post-Its by meeting facilitators

- **Part 2:** Pick priority issues
  - Put a mark beside the five stormwater program issues that in your opinion should be the top priorities
  - Circle the mark for your top priority

10/21/2009
<table>
<thead>
<tr>
<th>Element (Rank)</th>
<th>Description</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Public education - make people aware of existing problems</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Identify funding options for stormwater program</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Create problem area map to show locations/types of existing problems</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Locate and identify (map) existing stormwater system</td>
<td>8</td>
</tr>
<tr>
<td>5 (t)</td>
<td>Incentives for public entities and private landowners to improve stormwater quality</td>
<td>4</td>
</tr>
<tr>
<td>5 (t)</td>
<td>Develop solutions and respective costs (stormwater master plan, CIP)</td>
<td>4</td>
</tr>
<tr>
<td>5 (t)</td>
<td>Clarify roles between sanitary and stormwater authorities - BNWRD vs. Town of Normal</td>
<td>4</td>
</tr>
<tr>
<td>5 (t)</td>
<td>Promote “Green” concept for buildings (e.g., LEED)</td>
<td>4</td>
</tr>
<tr>
<td>9 (t)</td>
<td>Address system components that have had “deferred maintenance” - bring up to current standards</td>
<td>3</td>
</tr>
<tr>
<td>9 (t)</td>
<td>Meet NPDES regulatory requirements and Notice of Intent (NOI) commitments</td>
<td>3</td>
</tr>
<tr>
<td>9 (t)</td>
<td>Ensure stormwater funding method is equitable</td>
<td>3</td>
</tr>
</tbody>
</table>
The mission of the community’s stormwater management program is to enhance public health, safety, and the environment in order to protect lives and property and provide for a better quality of life.

(from Policy Issue Paper #1)
The Town of Normal must have a dedicated source of revenue from which to fund its stormwater management program in order to meet its stormwater management program mission. It has been determined that the primary source of program revenue should be a service charge. (from Policy Issue Paper #2)
SWAC Process
Policy Issue Paper #3 – Credit Program

- A system of credits will be implemented to provide non-residential customers the means by which to lower their stormwater utility bill in recognition of the customer reducing the burden on the Town’s stormwater management program that the property would otherwise create. *(from Policy Issue Paper #3)*
SWAC Process
Policy Issue Paper #4 – Flat Residential Rate

- There will be a single flat rate (as opposed to a tiered rate) charged to owners of single-family residential properties. *(from Policy Issue Paper #4)*
E: Funding Methods

Why user fees?

- Expansion of local government roles
- Changing stormwater programs
- Other prevailing priorities competing for general fund dollars - police, schools, etc
- Shift away from general taxes to fees and demand-based funding - solid waste, waste water
- Failure of other funding methods
Storm Water Utility

- **Stable** – reliable level of funding allows planning
  - not subject to multiple demands
- **Adequate** – program-driven funding levels
  - planned increases in service levels
- **Flexible** – single method or mix of funding methods
  - can include special districts
- **Equitable** – property owners pay based on demand they place on the program / system

10/21/2009
For every $1 dollar per month per house (and appropriate charges to non-residences), a stormwater utility can typically generate about $25 to $50 per acre per year.
Impervious Area

ERU = Equivalent Residential Unit

- Imperviousness is the only physical parameter per parcel
- Direct correlation to runoff and thus to demand
- Easily measured and verified
- Can set minimum threshold for billing (ERU)

Components:
- Driveway
- Rooftop
- Patio/Sidewalk

Residential Parcel
Aerial photography used to map impervious areas

Accurate account of impervious areas for individual properties

Sampling performed in residential areas for ERU determination

- 1 ERU = 3,200 sq. ft.

10/21/2009
Who Will Pay the User Fee?

Approximate User Fee Distribution
Town of Normal Stormwater Utility

- Office/Shopping (C-1, C-2, C-3) 4%
- Single Family Residential 29%
- Business (B-1, B-2) 16%
- Multi-Family (R-3) 9%
- Manufacturing (M-1, M-2) 24%
- Public Lands (S-2) 10%
- ISU (S-1) 8%
Credit programs provide rate reductions for property owners in recognition of the impact that on-site runoff control may have on the Town’s stormwater management program.

Credits are given for:

- Peak runoff rate reduction
- Runoff volume control
- Water quality control
How do credits work?

- Direct reduction of service charges
- Applied after service charges are calculated
- Must be applied for:
  - Criteria set by the Town
  - Maintenance of stormwater controls required
Storm Water Utility Ordinance:
http://www.normal.org/code/Chp7/Chp7.pdf#7.30-1

Storm Water Credit Manual:

Questions
How to Protect Shorelines on $25, or less, Per Day

Tom Ryan
Lake Sara Forever Foundation
How Can You Start a Project Without $$$?
Since Erosion Control Committee Creation during June, 2007:

- 3,900 of Transitional Wetland Breakwaters Constructed
- $306,000 Construction Expenditures
- Less than $1,000 spent on admin, research, design, & project management
Lake Sara - Effingham, IL

- 536 Acres
- 7,700 Acre Watershed
- Part of Upper Little Wabash Watershed
- On Impaired Waters List
- Governed by Effingham Water Authority
- 3 Board Members, 1 Superintendent & 1 Full time employee
- Approx. 450 Residences
Over 5 Miles of Unprotected Public Shoreline
Bluffs Erode an Avg. 10”/Year
High Waters of 2009
Cut Some Bluffs 2 –3 feet
Original slope when reservoir is filled

Eroded slope

Breakwater installed

- Slumped overhang
- Sediment accretion
- Vegetation establishment
Effingham Water Authority
Lake Sara
Breakwater with Transitional Wetland
Typical Section
A-3 riprap - 1.25 tons per foot

filter fabric - 15 feet wide anchored
12" steel pins

1.5 feet above full pool

10" min. thickness

maximum existing slope 8h:1v

H. Sutton, April 6, 2007
This Presentation’s Focus

• Minimizing Project Development Expense
• Team Formation & Recruitment
• Zero Cost Benchmarking & BMP Research
• Project Engineering on the Cheap
• How to Get the Real Money to Execute a Project
Team Formation

- Lake Residents have great skill sets
- Network or use news article to recruit
- Someone with a copy machine & presentation equipment is VERY useful
- PowerPoint skills come in handy
- A Licensed Professional Engineer saves bucks on sign-offs
- Stay focused & watch out for hidden agendas
- Most important… find people with time available.
Uncle Jack Wants You!

Erosion Control could use a few more volunteers.
“Sounds interesting.... how much do you volunteers get paid?”
Zero Cost Benchmarking & BMP Research

- Google Lots… see www.lakesaraforever.org for some of our favorite sites
- Contact Universities… SIU Lake Kinkaid research transferred directly to our lake
- Consult with government agencies… IEPA, SWCD, NRCS, ACOE very supportive
- Pick Vendors’ brains… Lake Rip Rap, Inc. really assisted development
How to Contact Sources

• Don’t be afraid to “cold call”
• Even if someone can’t help get a referral to someone who can
• Meet people face-to-face (eyeballs are important)
  ▪ If you only phone or e-mail, you’re just a bunch of electrons, not a human being
Designing on the Cheap

“It’s rock, not rocket, science”
Engineering Surveying Tools
Less Than $100
Pole & Protractor Measure Height & Slopes

Use Pencil to Measure > 10ft.

Swinging Protractor
Use 2 Measuring Sticks to Determine Shoreline Slope
Surveying Breakwater Position

- GPS
- Tape
- Rebar Stakes
BLUFF A

\[ \frac{25}{5} \]

\[ \begin{array}{l}
\text{Eroded Slope} \\
\text{Vegetated Slope}
\end{array} \]

\[ X = 45^\circ \text{ Slope 12' MAX} \]

\[ X = 65^\circ \text{ Slope 14' MAX} \]

\[ 6^\circ \text{ Shoreline Slope} \]

BLUFF B

\[ X = 45^\circ \text{ Slope 12' MAX} \]

\[ 4^\circ \text{ Shoreline Slope} \]

BLUFF C

\[ X = 25^\circ \text{ Slope 6' MAX} \]

\[ 4^\circ \text{ Shoreline Slope} \]

Pilot Area

BLUFF Contours

STORMWATER EROSION
Illinois Volunteer Lake Monitoring Program Loans Instruments
Obtaining Funds

• If you didn’t have to chase money it would all be fun and easy
• The real work starts here
Working with Government Agencies

• Meet people face-to-face
  - Eyeballs again
  - Present a business case to demonstrate, need, capability, & community support
  - Sell, but listen for advice
  - Determine how your project can support the agency’s (or individuals) objectives
  - Get the key people on the water, give tours
Favorite Government Snack
If You’ve Written a Term Paper, You Can Write A Grant Application
The Application Process

• Meet with the Grantor to determine best way to complete application & “hot button” issues

• Cite all the research that has been done on the lake...303(d) Impaired Waters, TMDL, Bathymetry, Watershed Plan, etc.

• Stress use of “Best Management Practices”
The Application Process

• Show that project is integral to SWCD Watershed Plan
• Stress community support, involvement, & outreach programs
• Double check that every issue mentioned by the Agency or application instructions is addressed
Security Cam of Tom Delivering 319 Grant to IEPA
Obtaining Matching Funds

• State Grants can match Federal (& vise-versa)...e.g PWLIP for 319 Grant

• Private Foundation Grants

• EWA Increased Boat Sticker Fee

• In-kind Services – Only count after contract signed. Wage rates: [www.bls.gov/bls/blswage.htm](http://www.bls.gov/bls/blswage.htm)

• Community Donations: Established Lake Sara Forever Foundation within Effingham County Community Foundation
The Effingham County Community Foundation Handles All Our Accounting & Tax Work

www.lakesaraforever.org
www.effinghamfoundation.org
Cottage Owners Are Passionate about Their Lake

- Phone Solicited Top Potential Donors
- Mailer, with Brochure, to All Residents
- Newspaper Article about Fund Drive
- Within Three Months:
  - $40,000 Cash Contributions
  - $150,000 Pledged over next 5 years
Project Management is a Juggling Act

Time

$$$

Skills

$
Channel Maintenance and Sediment Management on the Illinois Waterway
Nicole Manasco
US Army Corp of Engineers
(presentation not available)

Sediment Management of the Waterway as an Ecological Resource
Mike Demissie
Illinois State Water Survey

Sediment Quality and Beneficial Use Options
John Marlin
Illinois Sustainable Technology Center
Sediment Management of the Waterway as an Ecological Resource

by
Mike Demissie, Director
Illinois State Water Survey
Institute of Natural Resource Sustainability
University of Illinois
Champaign, IL
Recommendation 1 - Encourage beneficial use of sediments through three options for use of dredge materials:

- Establish discharge ports through levees at intervals determined by the Corps of Engineers and interested levee districts (internal sediment basins could be cash rented and farmed in one to two years).
- Use dredge spoil to strengthen and increase the internal/external thickness of levees along the Illinois River.
- Create new islands and/or increase the topographic diversity.

Recommendation 2 – Implement backwater lake and side channel sediment management measures at selected locations:

- Determine which lakes are priorities in terms of local support, ecological diversity of the corridor; the past and future uses of the lake, as well as the amount, type, and quality of sediment present.
- Review current lake management programs; develop appropriate sediment removal and disposal techniques.
- Reduce sediment inflow into the priority lakes from the Illinois River and tributaries.
- Restore wetlands along shorelines for stabilization and wildlife habitat.
The Illinois River is one of the major tributaries of the Mississippi River.

The Illinois River valley (that includes the main river, backwater lakes, side channels, and floodplain) is a significant ecological resource in the nation.

Many bottomland lakes along the river valley have lost much of their capacity due to sediment accumulation.
Erosion and sedimentation has long been recognized as the principal causes for most of the environmental and ecological problems in the Illinois River valley.

At the present there are many initiatives including the Illinois Rivers 2020, Illinois River Conservation Enhancement Program (CREP), and several others that are addressing the erosion and sedimentation problem in the Illinois River watershed.

The sediment budget analysis is one of the critical information used for identifying and prioritizing projects in the basin.
Bank Erosion along the Right Side (Looking Downstream) of Richland Creek
Partridge Creek Delta in 1985
Sedimentation in Peoria Lake
Sedimentation Problem in a Backwater Lake
Backwater Sedimentation
Sediment Budget of the Illinois River

Illinois State Water Survey
Sediment Budget of the Illinois River Valley

Sediment Input: 12.1 million tons per year

Sediment Deposition within the Illinois River Valley: 6.7 million tons per year

Sediment Outflow at Valley City: 5.4 million tons per year
Illinois River Sediment Budget Facts

- Average annual sediment delivery to the Illinois River valley – 12.1 million tons
- Average annual sediment discharge at Valley City – 5.4 million tons
- Average annual sedimentation – 6.7 million tons
- Percent deposited – 55 percent
- The Spoon and La Moine Rivers had the highest sediment yield rates for the period of analysis.
- The sediment budget for the 1980-2000 period will serve as a basis for measuring our progress towards reducing the sediment delivery to the Illinois River valley.
Man-made island(s) built in 1994 near Chillicothe in Upper Peoria Lake
Alternatives for potential island sites for Lower Peoria Lake
Preferred Island Location
Historical Change in Lower Peoria Lake since 1900

Lower Peoria Lake from 1900 to Today
Lower Peoria Lake with Man-Made Island

Lower Peoria Lake with Potential Artificial Island Site 101900-5
Lower Peoria Lake with Man-Made Island
Lower Peoria Lake with No Islands
Alternative Locations
Conceptual Design of an Island and Side Channel

Typical Peoria Lake cross section today

Peoria Lake cross section after island construction
Comprehensive Restoration Plan Proposed by Heartland Water Resources Council of Central Illinois
Proposed Demonstration Island Near Spring Bay
Alternative Island Locations in Upper and Lower Peoria Lake
Thank You!
Illinois River Sediment Quality and Beneficial Use Options

John C. Marlin
Illinois Sustainable Technology Center
Robert G. Darmody
Dept. of Natural Resources and Environmental Science
University of Illinois
• Reservoirs, river backwaters, and detention ponds are filling with sediment washed from land and stream banks. This destroys aquatic habitat, recreational potential and water supply functions. If a use can be found for the sediment, dredging to restore water depth becomes more feasible. Dredged material with suitable chemical and physical properties can provide needed topsoil at a variety of sites. This beneficial use can make dredging more economical as value is added at the restored site as well as the location receiving soil. It will also reduce the amount of soil taken from one area to benefit another.
Some Acknowledgements

Dr. Robert Darmody
Dr. Misganaw Demissie
Richard Cahill
Dr. Nani Bohwmik
Jim Slowikowski
DNR Field Staff and Site Managers
Illinois river Coordinating Council
Midwest Foundation
Artco Fleeting
Caterpillar Inc
Kress Corp
Brennan Marine
Tricounty Regional Planning Commission
Beneficial Use as Soil can

Restore economic and ecological values in aquatic systems

Provide soil for restoration and remediation

Reduce the need for taking soil from one area to benefit another
• The Illinois State Water Survey operates a coring rig capable of penetrating ten feet of mud. The cores are carefully opened in a laboratory, photographed, and described. Slices are taken along the length for chemical analysis, fertility testing, agronomic characterization, and determination of various physical properties.
Evaluation of Sediment Cores

- Potential Chemical Contaminants
- Agronomic Fertility
- Soil Classification and Consistence
- Grain Size
- Moisture Content, Density, etc.
• Cores collected from Putnam to Cass County have been analyzed and described. The following slides provide draft data on the properties of several cores. Collectively they illustrate the differences within individual locations as well as over the length of a core. These differences are due to such factors as the depth of water created by the diversion and dams, sedimentation rates, and discharge of chemical contaminants over the decades.
Upper and Lower Segments of Cores in Various Ill River Lakes

Goose Lk., Fulton Co.
- 295a 0-38 cm
- 295c 50-84 cm

Lower Peoria Lk. Near Channel, River mile 163.5
- 195a 0-48 cm
- 195f 196-243 cm

Sawyer Slough (lower end) Marshal Co.
- 277a 0-36 cm
- 277d 90-122 cm
Six Segments of Core 384 from inside East Port Marina Lower Peoria Lk.

384a 0-34 cm
384c 62-97 cm
384e 121-157 cm

384f 156-195 cm
384h 215-249 cm
384j 255-280 cm
Texture and Organic Matter of Sediment along East Port Channel in Lower Peoria Lake at Various Depths

<table>
<thead>
<tr>
<th>Approximate depth in cm</th>
<th>Core 195 USDA Texture</th>
<th>Core 197 USDA Texture</th>
<th>Core 384 USDA texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-40</td>
<td>Silty Clay Loam</td>
<td>Silt Loam</td>
<td>Silty Clay</td>
</tr>
<tr>
<td>100-120</td>
<td>Silty Clay Loam</td>
<td>Sandy Loam</td>
<td>Peaty</td>
</tr>
<tr>
<td>170-190</td>
<td>Silty Clay Loam</td>
<td>Silty Clay Loam</td>
<td>Clay Loam</td>
</tr>
<tr>
<td>250-270</td>
<td>Silty Clay Loam</td>
<td>Silty Clay Loam</td>
<td>Silty Clay</td>
</tr>
</tbody>
</table>

Organic matter content at various depths

<table>
<thead>
<tr>
<th>Core 195</th>
<th>Core 197</th>
<th>Core 384</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite 8-260 cm = 4.4%</td>
<td>26-28 cm = 4.6%</td>
<td>10-22 cm = 4.35 %</td>
</tr>
<tr>
<td>66-68 cm = 5.3%</td>
<td>90-52 cm = 49.7 %</td>
<td></td>
</tr>
<tr>
<td>106-108 cm = 3.9%</td>
<td>170-192 cm = 2.79 %</td>
<td></td>
</tr>
<tr>
<td>146-228 cm = 1.9%</td>
<td>210-272 cm = 3.21 %</td>
<td></td>
</tr>
</tbody>
</table>
### Selected Physical and Agronomic Properties of Core 279 from Babb’s Slough

<table>
<thead>
<tr>
<th>Depth cm</th>
<th>consistence (feel)</th>
<th>texture (feel)</th>
<th>% sand (feel)</th>
<th>moisture (% wet)</th>
<th>organic matter %</th>
<th>extractable P ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>6--8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>59</td>
</tr>
<tr>
<td>30--32</td>
<td>paste</td>
<td>Silt Loam (peaty)</td>
<td>&lt;1</td>
<td>10</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>46--48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>50--52</td>
<td>paste</td>
<td>Silty Clay Loam</td>
<td>12</td>
<td>8</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>86--88</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>70--92</td>
<td>very friable</td>
<td>Silty Clay</td>
<td>16</td>
<td>3.2</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>150--172</td>
<td>friable</td>
<td>Silty Clay Loam</td>
<td>17</td>
<td>2</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>206--208</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>210--232</td>
<td>friable</td>
<td>Sandy Loam</td>
<td>80</td>
<td>1</td>
<td>7</td>
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</table>
## Physical and Agronomic Properties of Core 277 from Babb’s Slough

<table>
<thead>
<tr>
<th>Depth cm</th>
<th>consistence (feel)</th>
<th>texture (feel)</th>
<th>% sand (feel)</th>
<th>moisture (% wet)</th>
<th>organic matter %</th>
<th>extractable P ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>6--8</td>
<td>fluid</td>
<td>Silty Clay Loam</td>
<td>7</td>
<td>56</td>
<td></td>
<td>56</td>
</tr>
<tr>
<td>10--12</td>
<td>paste</td>
<td>Silty Clay Loam</td>
<td>5</td>
<td>3.8</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>30--32</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td>3.8</td>
<td>56</td>
</tr>
<tr>
<td>46--48</td>
<td></td>
<td></td>
<td></td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50--52</td>
<td>very firm</td>
<td>Silty Clay</td>
<td>5</td>
<td>2.4</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>70--72</td>
<td>firm</td>
<td>Silty Clay</td>
<td>12</td>
<td>2.4</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>86--88</td>
<td></td>
<td></td>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90--92</td>
<td>firm</td>
<td>Clay Loam</td>
<td>40</td>
<td>1</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>110--112</td>
<td>friable</td>
<td>Clay Loam</td>
<td>45</td>
<td>1</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

**core 277**

---

```
Contaminant Testing

- 24 metals
- 22 pesticides
- 7 PCB arachlors
- 72 semi-volatile organics, including PAH
## Concentration of Selected Chemicals in Sediment Cores from Various Backwater Lakes in Illinois (preliminary data)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic mg/kg</td>
<td>9.6 R 6.4--13</td>
<td>4.9 R 2.9--6.8</td>
<td>7.3 R 5.3--9.6</td>
<td>5.0 R .81--7.6</td>
<td>6.2 R 4.1--8.4</td>
</tr>
<tr>
<td>Lead mg/kg</td>
<td>58.6 R 32--84</td>
<td>19.4 R 13--30</td>
<td>42.5 R 29--67</td>
<td>15.6 R 5.7--22</td>
<td>19.8 R 15--24</td>
</tr>
<tr>
<td>Zinc mg/kg</td>
<td>246 R 140--320</td>
<td>92.1 R 56--160</td>
<td>192.5 R 130--310</td>
<td>58.7 R 14--85</td>
<td>88 R 68--110</td>
</tr>
<tr>
<td>Dieldrin ug/kg</td>
<td>&lt; 22 R --</td>
<td>&lt; 12 R --</td>
<td>&lt; 22 R --</td>
<td>&lt; 2.9 R --</td>
<td>&lt; 6 R --</td>
</tr>
<tr>
<td>PCB 1254 ug/kg</td>
<td>55.4 R 22--130</td>
<td>25.9 R 11--59</td>
<td>91 R 32--210</td>
<td>&lt; 28 R --</td>
<td>&lt; 26 R --</td>
</tr>
<tr>
<td>BAP ug/kg</td>
<td>762 R 150--2200</td>
<td>104 R 23--430</td>
<td>194 R 60--340</td>
<td>&lt; 56 R --</td>
<td>14.2 R 7.5--26*</td>
</tr>
</tbody>
</table>

N= number of cores, R = range, core length varies from .7 to over 2 meters, * J values
Concentration of Selected Chemicals from Sediment Cores in Wightman Lake near Lacon

<table>
<thead>
<tr>
<th>Core / Chemical</th>
<th>269 8-250 cm</th>
<th>252 8-250 cm</th>
<th>268 8-246 cm</th>
<th>254 8-190 cm</th>
<th>267 10-112 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic mg/kg</td>
<td>13</td>
<td>12</td>
<td>6.5</td>
<td>10</td>
<td>7.7</td>
</tr>
<tr>
<td>Lead mg/kg</td>
<td>84</td>
<td>72</td>
<td>39</td>
<td>66</td>
<td>43</td>
</tr>
<tr>
<td>Zinc mg/kg</td>
<td>300</td>
<td>320</td>
<td>190</td>
<td>280</td>
<td>190</td>
</tr>
<tr>
<td>Dieldrin ug/kg</td>
<td>&lt;22</td>
<td>&lt;17</td>
<td>&lt;12</td>
<td>&lt;6.6</td>
<td>&lt;4.3</td>
</tr>
<tr>
<td>PCB 1254 ug/kg</td>
<td>40</td>
<td>130</td>
<td>37</td>
<td>68</td>
<td>35</td>
</tr>
<tr>
<td>BAP ug/kg</td>
<td>2200</td>
<td>550</td>
<td>160</td>
<td>750</td>
<td>240</td>
</tr>
</tbody>
</table>
Concentration of Selected Chemicals in Segments of Sediment Core 197 from East Port Channel, Lower Peoria Lake

<table>
<thead>
<tr>
<th>Core/Chemical</th>
<th>197 8-90 cm</th>
<th>197 108-134 cm</th>
<th>197 148-230 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic mg/kg</td>
<td>5.3</td>
<td>2.3</td>
<td>1.7</td>
</tr>
<tr>
<td>Lead mg/kg</td>
<td>40</td>
<td>17</td>
<td>8.9</td>
</tr>
<tr>
<td>Zinc mg/kg</td>
<td>190</td>
<td>90</td>
<td>41</td>
</tr>
<tr>
<td>Dieldrin ug/kg</td>
<td>&lt;16</td>
<td>&lt;3.5</td>
<td>&lt;22</td>
</tr>
<tr>
<td>PCB 1254 ug/kg</td>
<td>78</td>
<td>&lt;35</td>
<td>&lt;44</td>
</tr>
<tr>
<td>BAP ug/kg</td>
<td>240</td>
<td>72</td>
<td>44</td>
</tr>
</tbody>
</table>
• Sediment has been used as topsoil at several sites in Illinois including a strip mined area, three landfills, and two industrial sites converted to parks. The following slides show the placement of mud from the Illinois River at East Peoria on the Banner Marsh Marsh State Fish and Wildlife Area and the Pekin Landfill. Both sites experienced excellent plant growth on the sediment which was easily handled by conventional equipment.
July 22, 2004, Banner Marsh
August 17, 2004,  Banner Marsh
June 22, 2006  Banner Marsh
Pekin landfill August 2008  clay liner/sediment cap
jmarlin@istc.illinois.edu
rdarmody@illinois.edu

Illinois Sustainable Technology Center: www.istc.illinois.edu (click initiatives)

Illinois River Decision Support System http://ilrdss.sws.illinois.edu/
Economic Development: Developing and Showcasing Community Assets to Impact Quality of Life

Community and Environmental Benefits of Parks and Recreation
Laura Payne
University of Illinois Extension

Greenways and Trails Planning: People, Pathways, and Profits
George Bellovics
Illinois Department of Natural Resources

Lake Decatur Sustainability -- Economics, Environment, and Quality of Life
Keith Alexander
City of Decatur, Illinois
Community & Environmental Benefits of Parks and Recreation

Laura L. Payne, Ph.D.
University of Illinois Extension
Research to Practice: Why now?

- Evolution of community parks and recreation:
  - Late 1800’s: Social service for health/well-being
  - 1960’s-1970’s: Shift to activities and facilities
  - Modern social issues facilitated change:
    - “Graying of America”
    - At-risk Youth
    - Obesity
    - Chronic disease prevalence
    - Climate change
    - Pollution
  - We have come full circle….back to our original mission.

Why does leisure and recreation produce health benefits?

Several aspects of a leisure experience may facilitate health related benefits. For example, leisure/recreation is generally:

- Freely chosen
- Intrinsically satisfying
- Personally meaningful
- Enjoyable

Much research supports the above factors being important to experiencing leisure/recreation.
How do parks and recreation help communities?

Community Livability:

- Parks, trails and playgrounds among the top 5 most important community amenities (National Assn of Realtors & National Assn. of Home Builders).

- Recreation/parks and open space were ranked highest by small company owners who were relocating (Crompton, Love & More, 1997).
A study by Kuo et al. (1998) of green space in inner city areas found:

- The more green space there is available, the more common public spaces are used by residents.
- Relationships between neighbors are strengthened by the presence of vegetation;
- Compared to residents living near barren spaces, those closer to green spaces enjoy more social activities, know more neighbors and have a stronger sense of belonging.

In short, green spaces facilitate positive social ties.
Example: Union Point Park, Oakland California

- Highest concentration of kids in the city, yet fewest parks
- Over a 1,000 residents & 50 community organizations involved
- A former neglected industrial site transformed
Example: Village Homes, Davis, California

- A neighborhood designed to strengthen sense of community and social ties.
- Study by Francis (2002) found that Village residents have 2x the number of friends & 3x the social contacts compared to a conventional neighborhood in Davis.
Community Benefits

- Recreation programs associated with lower juvenile crime rates:
  - 25% drop in Kansas City in areas where midnight basketball was available.
  - 28% drop in Fort Worth within a mile of centers.
  - 28% drop in juvenile arrests in Ft. Myers following implementing an after school program.
- People with a park within walking distance use parks more and are healthier.
Economic Benefits of Parks and Recreation

- Neighborhood Parks account for a 20% increase in property values for homes that face or abut parks (Crompton, 2001).
- In Boulder, Colorado, homes adjacent to a green space were 32% higher in value than homes 3200 feet away (.65 mile).
- Proximate principle: homes near parks yield higher property taxes ~ offset expense of parks.
Environmental Benefits of Parks & Recreation

- Over 50 years one tree generates:
  - $31,250 worth of oxygen
  - $62,000 of pollution control
  - Recycles $37,500 worth of water
  - Controls $31,250 worth of soil erosion

(US Forest Service, 2001)
Environmental Benefits of Parks

- Parks and open space can help reduce the effects of urban “heat islands” (Ahrens, 2006)
  - Heat islands are created by excessive amounts of paved surfaces, buildings & population density
  - Results in temps higher on avg. 2-10 degrees F
  - Consequences: ↑air conditioning costs, ↑pollution, ↑increase heat related illness and mortality

- Trees and vegetation cool the air via shade and evapotranspiration (evaporation from leafy parts of plans)
Environmental Benefits: Trees

- Trees are effective cleaning agents. Here are some examples:
  - A 200,000 acre urban park tree canopy removed 48 lbs. of particulates, 9 lbs of nitrogen dioxide, 6 lbs of sulfur dioxide, 2 lbs of carbon monoxide, and 100 lbs of carbon daily (Coder, 1996).
  - New York City's trees removed an estimated 1,821 metric tons of air pollution in 1994 (Nowak, 1995).
Personal Benefits: Physical Health

- Frequent park users - higher perceived health
- Park users had fewer MD visits
- Longer stay at park - lower SBP
- Active park users - lower BMI
- Park users had lower cortisol levels compared to non-park users.

Community Health: Physical Activity

- 2/3rd of older adult park visitors reported high-moderate level of PA during park visit
- Adults who reported convenient & attractive surroundings were more likely to walk


Community Health: Physical Activity

- People who use parks can meet CDC recommendations for physical activity


Psychological & Social Benefits: Community Wellness Programs

- Respondents who participated once per week indicated greatest gains in physical parameters (flexibility, strength), social support & self-efficacy
Physical Benefits: Community Wellness Programs

- Participants in a community-based physical activity program increased
  - weekly caloric expenditure
  - physical activity frequency and duration

Health Benefits: Community Wellness Programs

- Participants in “A Taste of Healthy Living” reported:
  - Increased knowledge of community resources as a result of their program participation
  - Pedometers and supportive environment facilitated physical activity

Communit Health Benefits: Cognitive

- Mental fatigue & aggression was higher among urban public housing residents:
  - Living in buildings without “green”
  - Than those residing in buildings with more “green”

Community Level Benefits

- A statewide study in West Virginia found that counties with greater recreation opportunities (e.g., existence of parks, number of facilities, acres of recreation lands) also had higher rates of physical activity, lower health care expenditures, and lower obesity rates.

Organizational Resources for Parks and Recreation Development

- **Illinois Institute for Rural Affairs:**
  - [http://www.iira.org/](http://www.iira.org/)
  - Community MAPPING Program
  - Mapping your community’s health

- **Illinois Coalition for Community Services:**
  - [http://www.time-to.org/](http://www.time-to.org/)
  - Assist with non-profit status paperwork
  - Survey development & administration
  - Partnership development
Organizational Resources for Parks and Recreation Development

- University of Illinois Extension
  - Unit Offices in 92 counties:
    http://web.extension.uiuc.edu/state/index.html
  - Community Improvement Programs:
    - Community Swap
    - Community Development Toolbox
    - Conflict Resolution
    - Annual leadership conference
Organizational Resources

- American Planning Association: http://www.planning.org/cpf/
  - City Parks Forum: briefing papers
- Trust for Public Land: http://www.tpl.org/
  - Excellent City Parks Reports
  - Economic Benefits of Parks and Open Space
- Illinois Department of Natural Resources: http://dnr.state.il.us/
  - Community Park and Recreation Planning
  - Outdoor Recreation Facilities Guide
  - Guide to Playground Planning: http://dnr.state.il.us/publicservices/publications/freebies1.htm
Resources

- **IL Department of Natural Resources:**
  - Recreation Grant in Aid Program (Open Space, Land Acquisition and Development Grants)

- **Illinois Association of Park Districts:**
  - Grants for parks and recreation related initiatives
  - Power Play After School Program grants

- **National Recreation and Park Association**
  - NFL grants
  - US Tennis Association grants
Organizational Resources

- **Parks Victoria: Health Benefits of Parks**
  Annotated Bibliography

  - Click on “Healthy parks, healthy people”
  - Then click on “research”

- **Illinois Association of Park Districts:**
  - Bi-Monthly Magazine available online
  - 1st issue each year has a grants outlook article
Thank You

Questions?

We can be reached at:
Laura Payne: lpayne@illinois.edu
Greenways & Trails
People, Pathways & Profits

A Global look at
Greenways, Trails
& their benefits

By
George S. Bellovics
Landscape Architect
Greenways & Trails
People, Pathways & Profits

- What are Greenways and Trails?
- Why are they important?
- Where are they found?
- Who do they serve?
- How can they help?
- When can we start?
What’s Your Perception?
Remember to keep focus
Linear success, Parallel tasks
Greenways are distinct in the landscape…

Whether made from streams, drainage zones, forest blocks or …

From railroad rights of way
Greenways come in all shapes and sizes…

Gosh Pokey! Are these all Greenways???
What are Greenways? Simply put, Greenways are corridors of protected open space managed for conservation and/or recreation purposes.

Is this drainage way in a bean field a Greenway?

❖ Yes...
Greenways often follow natural land or water features, and provide links with Nature Preserves, Parks, Cultural Features and Historic Sites.

Greenways can be publicly owned or Privately owned, or as a result of Public/Private Partnerships.

Some Greenways include Trails, while others do not.

Some Greenways may be primary for recreation and people, while others may be just for wildlife.
Greenways which are planned elements are typically prescriptive. They have a function which is primary, and benefits which are secondary.
Rural Roads have a Greenway Capacity Too…

- Roads and their rights of way are valuable in linking places.
- Many contain wonderful habitats for plants and animals.
- Considering these resources in Greenway Plans will expand your ability to make critical connections.
What’s Old is New Again…

- Railroad Rights of Way, either abandoned or active, should be included in any Greenway Plan.
- Many times, they are the last remaining areas of native prairie, as well as valuable transportation links.
- Identifying the right of way as a Greenway will prepare you for a future trail opportunity, since the right of way as a trail becomes no less valuable for transportation.
Don’t forget about the water…

- Stream corridors, and their flood plains are important Greenways in nature.
- They have recreation potential for canoeing, fishing and birding.
- The variation in aesthetic character along “Blueways” can be as dramatic as can be found along Greenways.
For Every Season, Turn, Turn Turn…

- Take advantage of tourism opportunities in your greenway or trail.

- Seasonal opportunities to recreate or experience nature’s wonders can be found along greenways and trails.

- The change of seasons are powerful, spiritual events in many people’s lives.
Greenways Planning 101…
Who do you serve?  Who are your users?
## 2008 Participation - Ranked by Total Participation

*Participated more than once (in millions)*

*Seven (7) years of age and older*

<table>
<thead>
<tr>
<th>Sport</th>
<th>Total</th>
<th>Percent Change</th>
<th>Sport</th>
<th>Total</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Walking</td>
<td>96.6</td>
<td>7.6%</td>
<td>Backpack/Wilderness Camping</td>
<td>13.0</td>
<td>-0.1%</td>
</tr>
<tr>
<td>Swimming</td>
<td>63.5</td>
<td>6.1%</td>
<td>Softball</td>
<td>12.8</td>
<td>3.6%</td>
</tr>
<tr>
<td>Exercising with Equipment</td>
<td>63.0</td>
<td>9.2%</td>
<td>Tennis</td>
<td>12.6</td>
<td>2.9%</td>
</tr>
<tr>
<td>Bowling</td>
<td>49.5</td>
<td>5.1%</td>
<td>Volleyball</td>
<td>12.2</td>
<td>1.0%</td>
</tr>
<tr>
<td>Camping (vacation/overnight)</td>
<td>49.4</td>
<td>3.8%</td>
<td>Football (tackle)</td>
<td>10.5</td>
<td>-3.7%</td>
</tr>
<tr>
<td>Bicycle Riding</td>
<td>44.7</td>
<td>11.4%</td>
<td>Canoeing</td>
<td>10.3</td>
<td>na</td>
</tr>
<tr>
<td>Fishing</td>
<td>42.2</td>
<td>2.7%</td>
<td>Mountain Biking (off road)</td>
<td>10.2</td>
<td>9.6%</td>
</tr>
<tr>
<td>Workout at Club</td>
<td>39.3</td>
<td>6.8%</td>
<td>Scooter Riding</td>
<td>10.1</td>
<td>-4.6%</td>
</tr>
<tr>
<td>Hiking</td>
<td>36.0</td>
<td>10.5%</td>
<td>Skateboarding</td>
<td>9.8</td>
<td>-3.6%</td>
</tr>
<tr>
<td>Weight Lifting</td>
<td>37.5</td>
<td>6.5%</td>
<td>In-Line Roller Skating</td>
<td>9.3</td>
<td>-13.1%</td>
</tr>
<tr>
<td>Aerobic Exercising</td>
<td>36.2</td>
<td>4.1%</td>
<td>Paintball Games</td>
<td>6.7</td>
<td>-9.9%</td>
</tr>
<tr>
<td>Running/Jogging</td>
<td>35.9</td>
<td>18.2%</td>
<td>Skiing (alpine)</td>
<td>6.5</td>
<td>1.9%</td>
</tr>
<tr>
<td>Billiards/Pool</td>
<td>31.7</td>
<td>7.4%</td>
<td>Hunting w/Bow &amp; Arrow</td>
<td>6.2</td>
<td>7.5%</td>
</tr>
<tr>
<td>Basketball</td>
<td>29.7</td>
<td>5.7%</td>
<td>Snowboarding</td>
<td>5.9</td>
<td>15.6%</td>
</tr>
<tr>
<td>Boating, Motor/Power</td>
<td>27.8</td>
<td>-12.7%</td>
<td>Water Skiing</td>
<td>5.6</td>
<td>6.3%</td>
</tr>
<tr>
<td>Golf</td>
<td>25.6</td>
<td>2.6%</td>
<td>Target Shooting - Airgun</td>
<td>5.0</td>
<td>-24.8%</td>
</tr>
<tr>
<td>Target Shooting</td>
<td>20.3</td>
<td>-3.2%</td>
<td>Muzzleloading</td>
<td>3.4</td>
<td>-6.1%</td>
</tr>
<tr>
<td>Hunting with Firearms</td>
<td>18.8</td>
<td>-3.6%</td>
<td>Cheerleading</td>
<td>2.9</td>
<td>na</td>
</tr>
<tr>
<td>Yoga</td>
<td>16.0</td>
<td>17.1%</td>
<td>Hockey (ice)</td>
<td>1.9</td>
<td>-7.7%</td>
</tr>
<tr>
<td>Soccer</td>
<td>15.5</td>
<td>12.5%</td>
<td>Skiing (cross country)</td>
<td>1.6</td>
<td>-5.2%</td>
</tr>
<tr>
<td>Baseball</td>
<td>15.2</td>
<td>8.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Percent Change is from 2007*
Trail Systems
It’s the System that works!
Grand Illinois Trail: Many Trails – One Grand Project

- 500+ miles long on the outer loop area.
- Over 95 Government Agencies Partnering.
- Nations Largest Loop Trail.
- Connections to Wisconsin, Indiana, and Iowa.
Grand Illinois Trail
Where it's at…

- Over 320 miles of off-road trails in the planned 500+ mile system of are now in place.
- Projects are underway for an additional 20 miles of off-road trail and design for an additional 30 miles.
- About 150 miles of trail will always follow low volume county, township or city streets.
How Do We Get There?
PLANNING

Much work remains to be done before we can announce our total failure to make any progress.
CONSULTING

If you're not a part of the solution, there's good money to be made in prolonging the problem.

www.despair.com
What’s the Goal?
Strengthening Local Economies

- Increased property values
- Stimulated business activity
- Cost-benefit Analysis
Increased Property Tax Revenues

An increase in property values generally results in increased property tax revenues for local governments. Many arguments made for park and open space investment claim these acquisitions pay for themselves in a short period of time, due in part to increased property tax revenues from higher values of nearby property. A point to remember, however, is that many jurisdiction’s assessments of property values often lag behind market value. Furthermore, in those states which have passed legislation limiting real estate tax increases, such as California’s Proposition 13, property tax revenues also lag behind increases in market value.

- A study of the impacts of greenbelts on neighborhood property values in Boulder, Colorado, revealed the aggregate property value for one neighborhood was approximately $5.4 million greater than if there had been no greenbelt. This results in approximately $500,000 additional potential property tax revenue annually. The purchase price of the greenbelt was approximately $1.5 million. Thus, the potential increase in property tax alone could recover the initial cost in only three years. In the study, the authors did note that this potential increase is overstated in part because actual assessments may not fully capture greenbelt benefits (Correll, Lillydahl, and Singell, 1978).
In a recent study, *The Impacts of Rail-Trails*, landowners along three rail-trails reported that their proximity to the trails had not adversely affected the desirability or values of their properties. Along the suburban Lafayette/Moraga Trail in California, the majority of the owners felt that the trail would make their properties sell more easily and at increased values. The other two trails studied included the Heritage Trail in eastern Iowa and the St. Marks Trail in Florida. (National Park Service and Pennsylvania State University, 1992)

A study completed by the Office of Planning in Seattle, Washington, for the 12 mile Burke-Gilman trail was based upon surveys of homeowners and real estate agents. The survey of real estate agents revealed that property near, but not immediately adjacent to the trail, sells for an average of 6 percent more. The survey of homeowners indicated that approximately 60 percent of those interviewed believed that being adjacent to the trail would either make their home sell for more or have no effect on the selling price (Seattle Office of Planning, 1987).
Interstate 4 In Seminole County, Florida isolated two large networks of bicycle and multi-use trails. By building a bicycle/pedestrian bridge over the highway, county officials united two communities and connected the trail networks. As a result, County Commissioner Daryl McLain noted that “property values along the new [connected] trail have already shown increases.”
Municipalities throughout the United States have found economic benefits in Bike Trails within close proximity to residential areas.

Homes sales were examined in the seven Massachusetts towns through which the Minuteman Bikeway and Nashua River Rail Trail run.

Statistics on list and selling prices and on days on the market were analyzed. The analysis shows that homes near these rail trails sold at 99.3% of the list price as compared to 98.1% of the list price for other homes sold in these towns.

The most significant feature of home sales near rail trails is that these homes sold in an average of 29.3 days as compared to 50.4 days for other homes.”
Fargo Run Trails Concept

Legend
- Primary Trail Corridor
- Secondary Trails
- Principal Arterials
- Proposed Collectors

0 445 880 1,720 Feet
Prairie Crossing is a critically-acclaimed conservation community that was designed to combine responsible development, the preservation of open land and easy commuting by rail. The community consists of 395 energy-efficient single family homes and condominium residences. The single family homes are sold out, but a limited number of condominiums are still available! Please explore our website for information about the Organic Farm, shops and restaurants, Metra commuter rail service, Charter School, and our restored natural areas, as well as the Guiding Principles underlying the community.
Making Communities Better Places

- Increased social interaction
- Encouraging community pride
- Preserving what we value
- Protection against urban sprawl
- Providing alternative transportation
A Tale of Someplace USA
Between efforts to make bicycling better and improve the public realm in Manhattan, New York City has been making some steps to upgrade boulevard streets for more users — making the center medians of these facilities into usable and attractive public spaces rather than just an area between two directions of traffic.

Case in point: Pike Street. The city’s Transportation Department has been working to add physically separated bike facilities (or cycle tracks) along the central median in both directions and creating plaza-like public spaces by closing off certain intersections. Plans eventually call for adding trees, benches and gardens to the median promenade, through the Parks Department.

Citygarden, just west of the famed Gateway Arch on the Mississippi River, has drawn crowds of people—a cross-section of the city and region’s population—from its opening hour onward......

......For St. Louis, for years so forsaken its downtown had the feel of a big and mostly empty living room, the public’s warm embrace of Citygarden caps a remarkable comeback decade which has seen the center city draw 5,000 residents and more than $4 billion in new investment.
Encouraging Healthy Lifestyles

- Increased physical activity
- Improved access to facilities
- Opportunities for a variety of activities
- Inexpensive to join
Several findings from the Bureau of Transportation Statistics study indicate a growing concern among Americans with the impact of transportation choices on quality of life—and a willingness to consider bicycling as part of the solution. Half of all Americans (99.0 million people) believe that cars, SUVs, pickups, and vans are the primary cause of air pollution in their communities and 65 percent (135.4 million) are concerned about the level of traffic congestion on the roads in their communities. (They have a right to feel this way: Americans spend 75 minutes a day in their car.) Some 79.1 million (38 percent) of all Americans feel that the availability of bikeways, walking paths, and sidewalks for getting to work, shopping, and recreation is very important in choosing where to live.
Protecting the Environment

- Preserving open space by keeping it recreational
- Improve air quality and water quality
- Protecting habitat
Guiding Principles for Prairie Crossing

Ten important principles established by the community’s founders have guided Prairie Crossing since its inception. Together, these Guiding Principles provide the framework for a way of life that respects the environment and enables residents to experience a strong connection between community and the land.

Environmental protection and enhancement
Prairie Crossing’s land was purchased to safeguard its open spaces. 350 of its acres are legally protected from development. Prairie Crossing is part of the Liberty Prairie Reserve, over 5,000 acres of publicly and privately held land that includes nature and forest preserves, farms and trails. At Prairie Crossing itself, greenways have been constructed and houses placed to protect the environment, native vegetation and wildlife of the Midwest.
According to the Nationwide Personal Transportation Survey, 25 percent of all trips are made within a mile of the home, 40 percent of all trips are within two miles of the home, and 50 percent of the working population commutes five miles or less to work. Yet more than 82 percent of trips five miles or less are made by personal motor vehicle.

According to the Bureau of Transportation Statistics (BTS) October 2000 Omnibus Household Survey, 41.3 million Americans (20.0 percent) used a bicycle for transportation in the 30 days measured in the survey. Bicycling is the second most preferred form of transportation after the automobile, ahead of public transportation. More than 9.2 million (22.3 percent) of the 41.3 million people who bicycled did so more than ten of the 30 days.
Preserving our Culture and History

- Access to heritage and history
- Connections to historically and culturally significant facets of a community
- Historically significant transportation routes
Illinois Trail Advocates: Understanding Illinois’ Public Action Team

- Illinois Trails Conservancy
- League of Illinois Bicyclists
- Chicagoland Bicycle Federation
- Openlands Project
- The Nature Conservancy
- Illinois Paddling Council
- Illinois Greenways & Trails Council
- & Many More...
Lessons Learned:

- Large projects come from shared ideas and common goals.
- The overall project is made from smaller parts that rely on connections and destinations.
- A “work in progress” means what you do have does work.
- Create “identities” that fit with the “place”.
- Allow movement; Create access; Encourage involvement...Serve.
- Continue to evolve, strive to re-invent.
“Greenways & Trails Planning is all about making the Idea into reality…”

◆ Galena River Trail, Galena
Greenways & Trails are already a part of your surroundings. Recognizing how they can be a part of your County, your Community and your life is up to you.
Illinois Department of Natural Resources:
Participating in Trails Through Leadership in State & National Programs
Lake Decatur Sustainability – Economics, Environment and Quality of Life

Keith Alexander
Director of Water Management
City of Decatur, IL
217–424–2863
kalexander@decaturil.gov
Lake Decatur was built in 1920–1922
925 square mile watershed spanning 7 counties in east central IL, 85% of land in crop production
The water supply for Decatur and Mt. Zion, and backup for Long Creek & Harristown
Two water treatment plants – Decatur (21 MGD) and ADM (14 MGD)
75% of Decatur’s water, and 100% of ADM’s water, is used for commercial and industrial purposes.

Decatur’s largest customers are ADM, Tate & Lyle, Mt. Zion, PPG, Decatur Park District, two regional hospitals, Caterpillar and Millikin University.

Even though Lake Decatur looks large – 2,850 surface acres – it is very shallow with just under 22,000 AF of water storage.

Since 1922 sediment has reduced the lake’s volume by 28% – even after the lake was raised 4.5 feet in 1956 and significant areas were dredged.
1954 Drought
Economic Sustainability

- The lake is a key component of Macon County’s economy
- Other key components are prime farmland, enormous agribusinesses, substantial public and private infrastructure and highly productive citizens
- To economically sustain Lake Decatur, we have been working on two fronts:
  - Watershed Protection
  - Dredging
Decatur employed two soil conservationists in the early 1940s and helped establish the Macon Co. Soil & Water Conservation District (MCSWCD) in 1943.

Since 1987 Decatur has had an annual watershed improvement agreement with the MCSWCD.

Current agreement provides for $40K in BMP cost share funds, 2 full and 2 part time staff, & public education ($173,890 annually).

Since 2006 Decatur has had an annual watershed research and education agreement with the Agricultural Watershed Institute ($30,000 annually).

Several federal, state and private grants have been obtained and awards received throughout the years.
Dredging

- Why? To reclaim large areas of the lake that have literally filled up with sediment
- In order to get through the next major drought, we will need all the water we can get
- Other sources of water include an emergency water well field and two former sand and gravel pits
- Dredging will result in an 18% increase in lake volume
- Sediment traps created to protect the rest of the lake
- Improved recreation opportunities such as boating, fishing and swimming
- Enhanced property values – both public and private
- Total estimated cost of $31–37M
Watershed protection and dredging are also environmentally sustainable activities.

Watershed protection is an obvious activity, but what about dredging?

3,839 acre feet of sediment will be dredged which will also provide an identical amount of additional water supply.

Our sediment is mostly the finer silty clay and silty clay loam particles of some of the earth’s best topsoil.
What can sustainably be done with 3,839 AF of sediment?

- Place on farm ground like current storage site or spread thinly over even larger areas of farm ground?
- Fill gullies & ravines on eroded farm ground?
- Mix with compost or other materials to make topsoil to sell?
- Use for large scale landscaping, construction or land reclamation projects?
- We interviewed and evaluated 4 sediment recycling/reuse joint venture teams and have shortlisted to 2 teams
Quality of Life Sustainability

- The dredging project will not remove all of the accumulated sediment from the lake.
- Erosion, although slightly reduced over the past 25 years, still slowly fills the lake with silt.
- Anticipate long term increases in water use by commercial and industrial customers.
- Even with dredging we currently have a 10% annual risk of not having enough water for our customers during a severe drought.
- To reduce the risk to 2% in 2010 we need 10K acre feet of additional water.
Quality of Life Sustainability Includes Many Factors

- Economic – we export much needed products and services to the region and the world
- Revenue – must be sufficient
- Environmental – can be a difficult balance
- Public health – don’t overlook it
- Community aesthetics – what “look” do you desire and at what cost?
- Community pride and self worth – worth its weight in gold – cultivate it!
We think we’re doing just about everything we can to sustain Lake Decatur from an economical, environmental and quality of life point of view.
Need More Info?

www.ci.decatur.il.us
www.maconswcd.com
www.agwatershed.org
Soil and Water Movement I: Water

Water Level Fluctuation in the Illinois River and Effects in Floodplain Management and Wetlands
Rip Sparks
National Great Rivers Research and Education Center

Illinois' Lake Michigan Diversion Management: Have We Fulfilled Our Great Lakes Memorandum of Understanding Commitments
Dan Injerd
Illinois Department of Natural Resources

Trends in Illinois River Streamflow and Flooding
Vern Knapp
Illinois State Water Survey
Water Level Fluctuations in the Illinois River: Effects on Floodplain Management and Wetlands

2009 Governor’s Conference on the Illinois River
Soil & Water Movement Session 1: WATER

Richard Sparks¹, Nani Bhowmik², Misganaw Demissie², Henry DeHaan³

¹National Great Rivers Research & Education Center, Alton, IL
²Illinois State Water Survey, Institute of Natural Resource Sustainability, University of Illinois at Urbana-Champaign, Champaign, IL
³Rock Island District, U.S. Army Corps of Engineers, Rock Island, IL
Representative cross-section of the Illinois River-floodplain ecosystem.

Principle of Floodplain-River Ecosystem Conservation:

Organisms have adapted to the floodpulse that characterizes the river where they evolved.
Decline of Commercial Fish Harvest
Illinois River, 1895-1995

Clean Water Acts
**1996**

- **Jan** Planning Committee evaluates economic/natural resources information
- **Mar** Six Issues and Teams
- **Apr-Jun** Teams meet, develop solutions
- **Jul** Planning Committee provides additional direction
- **Aug-Oct** Teams prepare action plans & recommendations
- **Nov** Planning Committee considers Team results; makes recommendations to Strategy Team
- **Jan 1997** Integrated Plan
1993 Flood on the Illinois River

1994. Review of national floodplain management policy, to reduce risk, improve economic efficiency, & enhance the environment.
Jan 1997

- **Recommendations** (34)
  - Corridor
  - Soil & Water Movement
  - Ag practices
  - Economic development
  - Local action
  - Education

- Specific **plans** for action; **targets**
(7) Identify the causes of unnatural and natural water level fluctuations

(8) Establish water level management programs throughout the watershed for sediment management, waterbanking, and flood crest reduction.

(9) Selective dechannelization of tributaries on a voluntary basis.

(12) Improve monitoring of water & sediment

(13) Build wetlands and other water retention capacity in urban and rural areas in the Illinois Basin, in collaboration with appropriate public landowners and volunteering private landowners.
**Vision:** A naturally diverse and productive Illinois River Basin that is sustained by natural ecological processes and managed to provide for compatible social and economic activities.

3. Limiting Factor: Loss of Habitats and Functions

   - **Goal 3:** Improve floodplain, riparian, and aquatic habitats and functions.

5. Limiting Factor: Altered Hydrology and Water Levels

   - **Goal 5:** **Naturalize** Illinois River and tributary hydrologic regimes and conditions to restore aquatic and riparian habitats.

Natural Factors
- Precipitation Fluctuations
- Watershed Characteristics

Human Induced Factors
- Land-Use
- Hydraulic Modifications
  - Locks & Dams
  - Levees
- Water Diversions
Many native fishes require “natural” water regime.

Valued native fishes require “natural” spring flood to spawn and rear young and “natural” stable or slowly rising water to overwinter.

Erratic regime favors nonnative species.

“Reversals”, rapid rates of rise and fall, and midwinter water fluctuations disadvantage native fishes.

Moist soil plants need Spring floods to kill seedling trees. If water levels are too stable, trees will grow and shade out the moist soil plants.

Unnaturally frequent, little floods during the Summer growing season drown the moist soil plants.

Lack of flood harms native vegetation

Excessive flooding also harms vegetation
Lower Illinois River and its Floodplain
Levee and Drainage Districts
Profile of the Illinois River
1. 1971-2001 water level hydrographs (daily water levels) in Illinois River were used as input to **hydraulic model (ISWS)** of The Nature Conservancy’s Emiquon Floodplain Naturalization Project.

2. Output from Emiquon hydraulic model was used as input to the **moist soil plant model**.

**RESULTS** If gates are used to manage water levels, plants are produced most years and production is almost always higher than without gates.
## Potential Naturalization Impacts

<table>
<thead>
<tr>
<th>TNC’s Emiquon Project</th>
<th>Farming Eliminated</th>
<th>Refuge Management</th>
<th>Refuge with Recreation</th>
<th>Net Change (Potential)</th>
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Enhanced Water Level Management

Low Water Year
1991

Enhanced Water Level Management

- Peoria Existing Condition
- LaGrange Existing Condition
- LaGrange Enhanced Regulation
- Peoria Enhanced Regulation
One Team: Relevant, Ready, Responsive and Reliable

Enhanced Water Level Management

Elevation (ft. NGVD, datum of 1929)

High Water Year

1990
One Team: Relevant, Ready, Responsive and Reliable
1. Peoria Upper Island
2. Pekin Lake (Northern Unit)
3. Pekin Lake (Southern Unit)
4. Waubonsee Creek
5. McKee Creek
6. Kankakee River
7. Blackberry Creek
8. Iroquois River
9. Alton Pool
10. LaGrange Pool
11. Tenmile Creek
12. Yellow River
13. Senachwine Creek
14. Crow Creek West
15. Starved Rock Pool
16. Fox River Fish Passage
End of Sparks Presentation
ILLINOIS’ LAKE MICHIGAN DIVERSION MANAGEMENT: HAVE WE FULFILLED OUR GREAT LAKES MEMORANDUM OF UNDERSTANDING COMMITMENTS?

Daniel Injerd
Office of Water Resources
Illinois Department of Natural Resources
<table>
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<th>Year</th>
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<th>Running Average (cfs)</th>
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Illinois’ Commitments Under MOU

- Construct Chicago River Turning Basin Wall (done)
- Construct Pumping Station (done)
- Review all Domestic Allocations (done X2)
- Reduce Discretionary Diversion and Navigation Makeup Allocation (done)
- Leakage Repairs at Chicago River (almost)
- Lakefront flow measurement (done)
- Repay Illinois’ Water Debt by WY2019 (done!)
## COMPARISON BETWEEN 1998 ALLOCATIONS AND 2007/2008 LAKE MICHIGAN WATER REALLOCATION

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<th>Total Allocation (in MGD)</th>
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<td>3182</td>
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<td>3172</td>
<td>773</td>
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*Estimated
Breakdown of Diversion for Water Year 2005

- Domestic 1063 mgd
- Runoff 448 mgd
- Direct Diversion 250 mgd
• “SEC. 345. CHICAGO SANITARY AND SHIP CANAL DISPERSAL BARRIER, ILLINOIS.”

• (d) FEASIBILITY STUDY.—The Secretary, in consultation with appropriate Federal, State, local, and nongovernmental entities, shall conduct, at Federal expense, a feasibility study of the range of options and technologies available to prevent the spread of aquatic nuisance species between the Great Lakes and Mississippi River Basins through the Chicago Sanitary and Ship Canal and other aquatic pathways.
Trends in Illinois River Streamflow and Flooding

H. Vernon Knapp, Interim Director
Center for Watershed Science

Illinois State Water Survey
Institute of Natural Resource Sustainability
University of Illinois at Urbana-Champaign
Selected recommendations from the Illinois River Integrated Management Plan

- Determine the contribution of changing precipitation patterns to streamflow trends
- Conduct analysis to examine why the frequency of major floods is increasing
- Establish goals for water yields
Illinois River at Kingston Mines, 1940-1987

Peak flow (cubic feet per second)

Source: Ramamurthy, Singh and Terstriep (1989)
Peak flow (cubic feet per second)

1940-2007
Which trend do you believe?
Evaluation of Streamflow Trends

- Highly dependent on period of years analyzed
- Hydrologic and climatic records experience considerable inter-decadal variability
- Most observed trends are not based on factors that are highly predictable into the future
- The best perspective on streamflow trends is provided by looking at the broader picture
  - longest historical flow records
  - what’s happening within the greater region
HCDN Streamflow Trend Studies

- McCabe and Wolock (USGS, 2002)
  - For much of Eastern US, the 1971-1999 average and minimum streamflows were significantly greater than the previous 30 years (1941-1970). This did not have the character of a linear increasing trend, but of an abrupt step increase, coincident with an increase in precipitation. There were comparatively few trends in annual maximum flows.

- Knapp (2005)
  - Looked at only the longest available records (>90 years) in the Eastern US. From these longer records, the only region with consistent increasing trends is the upper Midwest.
Significant Trends in Average Flow, Records > 90 years
The longest records are on the Mississippi River; total flow is highly correlated to precipitation.
*Flow record includes: USGS gage at Kingston Mines 1940-2009; USGS gage at Peoria 1903-1906 & 1910-1939; Weather Bureau daily river stages, 1884-1910, with flows estimated from 1903 USGS rating curve. Influence of Lake Michigan diversion has been removed from flow records.
La Moine River at Ripley

10-Year Average Precipitation (inches)
10-Year Average Streamflow (inches)

Similar patterns and high correlation for major tributaries
The changing precipitation pattern is the dominant factor in determining water yield

- Despite all of the hydrologic changes (including artificial drainage and land use change) over the past 130 years, the relationship to precipitation in these and other long-term records has been remarkably consistent.

- Mass land use changes can change yields (somewhat)
  - Urbanization
  - Vegetative cover with high transpiration rates

How does this relate to flooding trends?
Illinois River at Peoria - Kingston Mines

Relationship between average flow and high flows

10-Year Average Flow (cfs)

Average flow

High flow


10-Year Average High Flow (cfs)

10-Year Average Flow (cfs):

Average flow

High flow

r = 0.803
Major tributaries: Either increasing trends in both average and high flows …
...or no trends in average and high flows
Change in Flooding Season

1884-1970

1971-2009
Factors affecting shifts in flooding season 1970-2008

- Warmer winters and decreased snowfall have reduced the magnitudes of floods in early spring.
- Increase in heavy precipitation events, particularly in the latter half of the year.
- General increase in soil moisture in summer and fall (caused by greater precipitation throughout the year).
Trends in Illinois River flooding are most directly related to trends in average flows and precipitation

Caveats
- This same relationship of increasing trends in both high flows and average flow is not present in all regions of the Midwest.
- These results also do not directly apply to small- and medium-sized watersheds, where storage and other local factors can commonly affect trends in flooding.
- Local efforts to detain floodwaters clearly have an affect on flood peaks in smaller streams.
- Issue of scale – There are many examples in hydrology where processes observed on smaller streams are not translatable to larger streams.
What does the future hold for us? How will the climate change?

Illinois River at Peoria-Kingston Mines

Annual Precipitation 10-year moving average (inches)

Annual Streamflow 10-year moving average (inches)

Precipitation
Streamflow

What does the future hold for us? How will the climate change?
Climate Change Impacts on Water Resources

Recent climate change reports have projected the following for the Great Lakes and Midwest:

- We could see wetter Springs and drier Summers
- Heavier precipitation events may increase in magnitude and frequency as part of climate change, causing more flooding
- There could be extended summer periods of precipitation deficit and low flows
- Thus, the hydrologic cycle could intensify, resulting in more extreme floods and droughts
These reports base their conclusions on selected climate scenarios

However,

- There are 23 Global Climate Models considered to be equally credible
- Over 150 different scenarios from these models
- The models are consistent with respect to temperature increase, although the projected amount may differ
- Precipitation is more difficult to model and there is little agreement between models in precipitation trends, much less in determining seasonal trends
- “It’s hard to place much confidence in any one characterization of future precipitation when the various models are all across the board.”
Inconsistency between the current Midwest climate and global model predictions

- Much of Midwest (and eastern USA) shows no 20th Century warming. Precipitation has increased by 7-10% for much of the Upper Midwest. Some GCM models suggest precipitation increases of this magnitude, but only following 50-100 years of climate change.

- This means either that observed patterns in precip and streamflow over the past 30 years are associated almost entirely with climate variability, or that the GCM models are not developed enough to correctly predict climate trends (or perhaps both are true) in the Midwest.

- The precipitation/streamflow increase of the past 30 years does appear to be within the range of conditions that have been experienced in the previous 150 years (although at the upper end of the range).
Conclusion

- In the Illinois River basin, precipitation changes appear to be the driving force behind increases in streamflow and flooding.
- We have only a limited influence on water yields.
- We don’t have a reliable projection of future climate conditions and how streamflow and flooding will change.
- Projected precipitation changes differ considerably depending on climate model. Common perceptions concerning their potential impacts may not hold true for the Midwest and other regions.
In the Corridor

Emiquon: A Fish Biologist's Input
Rob Hilsabeck
Illinois Department of Natural Resources

Habitat Restoration: NRCS Perspectives
David Hiatt
Natural Resources Conservation Services

Waterbird and Wetland Monitoring at Emiquon Preserve
Josh Stafford
Illinois Natural History Survey

Habitat Restoration at Emiquon: A Partner's Perspective
Troy Hythecker
U.S. Army Corps of Engineers

Middle Mississippi River Regional Corridor:
Lessons Learned from a Collaborative Planning Study
Brian Johnson
U.S. Army Corps of Engineers
Primary Objective

… to restore natural ecological processes and habitats that promote and sustain the native species and aquatic and terrestrial communities once found in this region of the Illinois River.
Supervise State's Biggest Fish Kill of '64

Assembled for a photograph at Canton Lake Monday are the Illinois Department of Conservation men who carried out the complete eradication of the lake. From left: Rudy Stinaver, Havana; Ken Russell, Galesburg, supervisor of the operation; Jim Allen, El Dorado; Jim Sublett, Hebron; Leo Rock, Sterling; Ed Pickering, Oregon and Bill Fritz, Clinton.
<table>
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<th>Species</th>
<th>Min. LGTH</th>
<th>Daily</th>
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<td>LG M Bass</td>
<td>18&quot;</td>
<td>1</td>
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<tr>
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<td>14&quot;</td>
<td>6</td>
</tr>
<tr>
<td>Channel Cat</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Crappie</td>
<td>9&quot;</td>
<td>25</td>
</tr>
<tr>
<td>Bluegill <em>LePomis</em></td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>
Work together or otherwise we stand alone looking at the turbid water!
NRCS, WRP and EMIQUON

Dave Hiatt
Wetlands Reserve Program
EWP Floodplain Easement
Program Coordinator
USDA-NRCS
Types of Easements

- Wetlands Reserve Program.
- Floodplain Easement Program.
What is a conservation easement?

- A conservation easement purchases *rights* to a property. The landowner retains ownership to the property, however the use of the property is restricted by a Warranty Easement Deed.
What *rights* does the landowner retain when they sell the NRCS and easement?

- Title
- Control of Access
- Recreational Pursuits
- Quiet Enjoyment
- Subsurface Minerals
Wetlands Reserve Program

- Permanent easement.
- 100% of agricultural appraised valued
- 100% of restoration cost-share agreement
- In perpetuity.

- Thirty year easements
- 75% of agricultural appraised value.
- 75% of restoration cost-share agreement.
- All rights to property return to landowner at end of 30-year contract.
Wetland Reserve Program – Eligibility Requirements

- Hydric soil
- Cropping history, 3 out of last 5 years
- Must be restorable
WRP- Objectives and Program

Emphasis

- Purchase and restore wetlands habitat first and foremost for migratory birds and threatened and endangered species.
- Attenuation of flood flows
- Protection and improvement of water quality.
- Recharge of ground water.
Emiquon Restoration and WRP

- 30 year easement
- Easement entails 6,285 acres
- Purchased in June 2006
- Restoration began in Spring 2007
Emiquon Restoration and WRP

- Bottomland Hardwood Tree Planting 405 ac.
- Upland Tree Planting 421 ac.
- Wet Prairie Establishment 218 ac.
- Upland Tall Grass Prairie Establishment 365 ac.
Hydrologic Restoration – To date this has consisted of nothing more than shutting off the pumps. Should additional hydrologic restoration be implemented?
Emiquon Future Restoration cont.

- How is the hydrology of the site going to be managed? How can we mimic a natural drawdown, like would have occurred historically along the Illinois River. At present we have too much water and no ability to manage the water levels.
Emiquon Future Restoration cont.

- Do we/should we have an Illinois River connection at Emiquon? If so, can this connection be utilized to manage the hydrology? How will this effect water quality/quantity, sedimentation, invasive species, and vegetation.
Emiquon Future Restoration cont.

- US Army Corps of Engineers – Levee
- Drainage Districts
- Lock and Dam
NRCS, WRP and EMIQUON

Dave Hiatt
1001 N. York St.
Martinsville, IL 62442
217 382-4123, Ext. 3
dave.hiatt@il.usda.gov
Waterbird and Wetland Monitoring at The Emiquon Preserve

Joshua Stafford, Randy Smith, Aaron Yetter, Chris Hine, and Michelle Horath
Institute of Natural Resource Sustainability
Forbes Biological Station, Havana, IL
Monitoring

2007

- Bird Inventories
  - Fall only
- Duck Behavior
- Seed sampling
- Wetland Habitat Mapping
Monitoring

2007
- Bird Inventories
  - Fall only
- Duck Behavior
- Seed sampling
- Wetland Habitat Mapping

2008
- Bird Inventories
  - Fall and Spring
- Brood Monitoring
- Duck Behavior
- Seed/Invertebrate Sampling
- Wetland Habitat Mapping
Brood Observations

- Counted broods every-other week
- 5 June – 20 August
- Fixed points
- Four Observers
- 2 Flush Counts
Brood Monitoring

- **Passive Counts - 2008**
  - 6 observations
  - 4 observers

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<tr>
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<td>19</td>
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<tr>
<td>Pied-billed Grebe</td>
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<tr>
<td>Canada Goose</td>
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Bird Inventories

Ground

Air
Waterfowl Inventories

Fall Comparison

- Ground 07
- Ground 08
- Aerial 07
- Aerial 08
- Coot 07
- Coot 08
Waterfowl Inventories

Spring 2008

Ground
Aerial
Coots

12/24 1/13 2/2 2/22 3/13 4/2 4/22

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000

64,228
69,020
A little perspective

- **Fall use of Emiquon by dabbling ducks**
  - 26.5% and 45.6% of Use-days (UDs) in the IRV during 2007 and 2008

- **Diving duck use of the IRV was low**
  - Nonetheless, Emiquon accounted for 1.4% (2007) and 46.3% (2008) of use

- **American coot UDs at Emiquon were exceptional**
  - Emiquon accounted for 51.7% total UDs in 2007 and 94.3% in 2008
Waterfowl Behavior

- **Why?**
  - Numerical and Functional Response
  - What are ducks doing?
    - Feeding Site? Roost Site?
  - Seasonal differences
  - Address missing habitat components
Waterfowl Behavior

Fall Comparison

- Feed
- Rest
- Other
- Social
- Motion

Fall 2007

Fall 2008
Moist-soil Seed Sampling

• 20 core samples each year (07, 08)
• Thompson Lake only
• Estimate kg/ha
  • Estimate available energy using acreages from covermap
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<th>Kg/ha</th>
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<td>244.2</td>
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629 ac to 2,662 ac
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<td>Willow</td>
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Future Monitoring

- Continue existing efforts
- Disturbance Monitoring?
  - Researchers and recreational users
  - Waterbird nesting
- Other Projects
  - Mallard ecology during fall migration
Questions?

Emiquon Preserve 11/29/2007
Waterbird Broods at Emiquon - 2008

- 6/5/2008: 1
- 6/17/2008: 4
- 7/9/2008: 22
- 7/22/2008: 27
- 8/7/2008: 26
- 8/20/2008: 31
2009 Monitoring

• Similar to 2008
• Disturbance Monitoring
  – Researchers and recreational users
  – Waterbird nesting
• Other Projects
  – Mallard ecology during fall migration
  – Giving up density
Waterfowl Inventories

• Fall 2008
  – 11 Ground
    • 2 September – 8 December
    • Peak: 34,855
    • DUDs: 1,786,547
    • 17 Duck Species
    • 87.6% Dabbling Ducks
  – 13 Aerial
    • 2 September – 28 December
    • Peak: 50,260
Waterfowl Inventories

- Spring 2008
  - 8 Ground
    - 19 February – 14 April
    - Peak: 64,228
    - DUDs: 1,219,605
    - 19 Duck Species
    - 56.2% Diving Ducks
  - 4 Aerial
    - 10 March – 2 April
    - Peak: 69,020
Brood Monitoring

- Passive and Active Counts
  - 6 Passive observations
  - 4 Observers

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<td>Unk. Duck</td>
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<td>Canada Goose</td>
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<td>Pied-billed Grebe</td>
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Waterbird and Wetland Monitoring at The Emiquon Preserve

Joshua D. Stafford, Randolph V. Smith, Chris S. Hine, Aaron P. Yetter, and Michelle M. Horath
2009 Illinois River Conference
HABITAT RESTORATION AT EMIQUON: A PARTNER’S PERSPECTIVE

Troy Hythecker
Civil Engineer
U.S. Army Corps of Engineers, Rock Island District

Presentation to the Illinois River Governor’s Conference-October 22, 2009
Agenda

- Background
- Goals and Objectives
- Potential Project Features
- Partnership at Emiquon
- Current Project Status
Background

- Feasibility Study in the Section 206 Aquatic Ecosystem Restoration Program
- Project is cost shared 65% federal, 35% non-federal
- Property acquired in 2000, feasibility study started in 2005
Goals and Objectives

- Restore functional floodplain habitat
- Restore more natural hydrology
- Increase connectivity between the river and spawning/nursery/wintering habitats for aquatic organisms
- Increase habitat for fish, waterfowl, shorebirds, mussels, and other wildlife that utilize floodplain habitat
- Restore native vegetative communities
- Improve water quality through processing of nutrients and sediments
- Export biological productivity to Illinois River
Potential Project Features

Water Control Structure

Pump Station

Islands

Levee Repairs

Emergency Spillway
Partnership at Emiquon

- Sponsor: The Nature Conservancy
- Ecology: Science Advisory Council composed of Federal and State agencies, Universities, NGOs
- USACE/NRCS Partnership Agreement & WRP
- Hydraulics/Hydrology: ISWS
- Habitat Benefits: USFWS, ILDNR
- Archaeology: Dickson Mounds Museum
- Spunky Bottoms: USACE- St. Louis District
- Other coordination: ILDOT, Ameren
Benefits of Partnership at Emiquon

- Utilize experts and experience from multiple perspectives to develop consensus for science-based restoration
- Multiple programs bring funding and expertise to benefit the ecosystem
- Data collection, modeling, and monitoring inform decisions for each other
- Great opportunity for landscape scale restoration of the Illinois River floodplain
Partnership Challenges

- Multiple perspectives bring varied opinions and sometimes competing objectives.
- Coordination and communication can be challenging.
- Different programs have varying timelines, constraints, and ability to implement projects which can change the site conditions.
Partnership Opportunities

- Emiquon is a case study in how partnership and multiple agencies and organizations can come together to benefit the ecosystem.
- Apply lessons learned and ability to work through policy issues to benefit other projects in the Nation.
- Fully achieve the goals and objectives for ecosystem restoration at Emiquon!
Middle Mississippi River Regional Corridor

Lessons Learned from a Collaborative Planning Study

Brian Johnson
US Army Corps of Engineers

12th Biennial Governor’s Conference on the Management of the Illinois River
What was the MMRRC Study?

• 2 year watershed study (1 of 5 pilot studies)
• Facilitate collaborative planning
• Intent was to develop tools for the region to use, without end result being Corps projects.
• 100% Federally funded
Where is the Middle Mississippi River?
The Middle Mississippi River

- Nationally significant waterway
- One of the world's most intensively regulated river systems
- Major international migratory flyway
- Highly productive farm ground
- Major urban areas
- Most of the river and its associated floodplain have been extensively modified
Major Issues and Concerns on the Middle Mississippi River

- Loss of habitat
- Lack of river connectivity
- Need for continued agricultural viability
- Need for a reliable navigation system
- Increasing demand for recreation opportunities
- Strong inter-agency interest in working together
MMR Regional Corridor Study

• Natural Resource centered
  3 focus areas

  1. Develop a science-based regional
     restoration planning and prioritization tool

  2. Set Regional Goals and Objectives
     • 12 issue/resource concern areas

  3. Complete Reach Assessments
     • On the ground needs/opportunities
Natural Resource Planning Tool

Strong desire for a landscape level planning tool to help drive future regional natural resource planning.

• Hydrogeomorphic Tool
  • Science-based
  • GIS based planning tool
  • Successfully applied elsewhere
“Pieces to the Puzzle”

- Soils
- Geomorphic surfaces
- Topography
- Climate
- Flood frequency
- Plant and Animal Communities
How it Helped the Region

- Quantified what habitat was there
- Quantified what is left
- Identified what the restoration potential is
- Defined where you need to go to get habitat back
- Helped focus the region (collective priorities)
- Allow the region to set scientifically defensible restoration/preservation targets
Habitat Conditions

What was there  What is left  What could be
Setting Regional Goals, Objectives, & Strategies

- Expand upon the earlier work of the MMRP
- Conducted focused workshops based on regionally important resources and values.
  - Worked closely with MMRP and many other regional stakeholders.
  - Set objectives and developed cooperative strategies to accomplish objectives.
- Identified the next steps.
Important Resources and Values

- Forests
- Wetlands
- Wildlife Habitat
- Ag Production
- Aquatic Habitat
- Recreation
- Transportation

- Floodplain Management
- Water Quality
- Non-Native Invasive Species
- Information & Outreach
- Economic Impact
Setting Regional Goals, Objectives, & Strategies

- Expand upon the earlier work of the MMRP
- Conducted focused workshops based on important resources and values.
- Worked closely with MMRP and many other regional stakeholders
- Set objectives and developed cooperative strategies to accomplish goals.
- “Middle Mississippi River Regional Plan”
Reach Assessments

• Took a “bottom up” approach.
• Broke the basin into 5 “workable” reaches.
• Conducted reach workshops with local stakeholders.
• Identified existing information, needs, and opportunities in each reach.
• Culminated in written reach assessments.
5 Reaches

Reach Coordinators

SW Illinois RC&D
Corps of Engineers
Illinois Dept. Natural Resources
US Forest Service
American Land Conservancy
Study Products

• Restoration Report
• GIS data layers
• Middle Mississippi River Regional Plan
• Interactive Reach Maps
• 5 Reach Reports

www.midmiss.org
Lessons Learned
The Region Will Take Ownership in Collaborative Efforts if the Individual Agencies and Organizations See the Value

- Significant parts of the study led/completed by partners agencies
- $184,000 contributed to the study in “volunteer” labor
- Over 40 agencies, organizations, groups actively participated
Having an Organization Already in Place at the Start Helped

**Middle Mississippi River Partnership**

- Multi-state, multi-jurisdictional collaboration of 20 federal/state agencies and not-for-profit organizations
- Recognized need for better planning and coordination on the MMR
- Formed under MOU in December 2004
Middle Mississippi River Partnership

- American Land Conservancy
- Ducks Unlimited, Inc.
- Illinois Forestry Dev. Council
- Ill. Society of American Foresters
- Missouri Dept. of Conservation
- Ill. Dept. of Natural Resources
- The Conservation Fund
- The Nature Conservancy
- US Geological Survey
- USDA Forest Service

- SIU Carbondale
- Upper Mississippi & Great Lakes Region Joint Venture
- USDA NRCS (Illinois)
- Wildlife Forever
- USACE, St. Louis District
- US Fish & Wildlife Service
- US EPA
- Missouri Dept. Natural Resources
- Southwestern Ill. RC&D
- Southern Illinois Community Foundation
- USDA NRCS (Missouri)
Having an Organization Already in Place at the Start Helped

- Built in Network
- Group ready to run
- Established and organized entity to carry on the efforts after study completion
Understanding of Other Agencies Programs and Authorities is not Good
Since the Study Ended

- MMRP has established 3-5 year priorities and focus areas using the Middle Miss Regional Plan.
- MMRP has established Champions in important focus areas.
- MMRP using the HGM results to establish collective restoration targets.
- Individual agencies using the HGM results for their planning.
- Corps using results to help set restoration objectives for our regional ER programs.
Questions?

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www.midmiss.org
Implementing Community Development Strategies and a Vision for Economic Growth

Mayor Robert Eschbach
Ottawa, Illinois

Reed Wilson
City of Ottawa
Economic Development

Mayor Robert Eschbach
and
Reed Wilson,
Director of Economic Development

City of Ottawa
Thursday, October 22, 2009
Illinois River Town
History
History
KEY ECONOMIC DEVELOPMENT INGREDIENTS
INCENTIVES LAY THE GROUNDWORK FOR GROWTH
Ottawa Industrial Park
Ottawa Industrial TIF

Legend:
- Canal TIF
- Dayton TIF
- Downtown TIF
- East TIF
- North TIF
- Ottawa Industrial Park TIF
TIF DEVELOPMENT
Kohl’s Distribution Center
Kohl’s Distribution
Kohl’s Distribution Center

Over 9 Miles of Conveyor Belts
RE Volv ing Loan Fund
Wastewater Treatment Facility
EASTSIDE REGIONAL LIFT STATION
• West Side Water Tower
Street Repair Program

[Images of street repair work, including workers, equipment, and road construction scenes]
Illinois River is a Key Part of Ottawa’s Future
ENHANCE THE QUALITY OF LIFE
Ottawa Township High School music program
SEEKING PRIVATE SECTOR SUPPORT
- Individual
Wind Farms
HEALTHY AND VIBRANT DOWNTOWN WHICH ATTRACTIONS VISITORS AND TOURISTS
Downtown Development
Ottawa, Illinois
September 2008

Destination Development

Branding, Development, & Marketing Action Plan
Ottawa’s Brand Promise
(the downtown Ottawa of the future)

Green and glorious, the new Ottawa has emerged as a gardener’s paradise, a regional centerpiece for the botanical arts. Once the western frontier of our nation, then a vital transportation and manufacturing link in the Midwest, Ottawa now stands as a premier destination for the traditions and practical art of gardening.

Ottawa’s historic downtown and its architecturally beautiful buildings have been transformed into an engaging botanical experience showcasing the aesthetic pleasures of plant life in its many forms. The waterfront invites a meander, with its beautiful English-inspired greenhouse, while the downtown features unique signature shops and original restaurants showcasing organic produce along the tree-lined streets shimmering with springtime blossoms. Here you can also learn from Master Gardeners, watch skilled craftsmen create outdoor art from glass, iron and clay, or just amble through the Farmer’s Market for the best produce the region has to offer.

Each season Ottawa brings new gardening experiences to life – whether it is to shop for specialty tools and supplies amid the fragrances of spring and summer, enjoy the fall harvest celebration, or experience the dazzling light displays during the winter – all the while learning how to prepare your garden for the next season. Ottawa surprises and delights gardeners, young and old, throughout the year.
WHY IS A BRAND NEEDED?

The generic, all-things-to-all people approach to marketing your city just does not cut it anymore. These campaigns all seem the same and will not survive the quick, couple of seconds glance given to the campaign by the average viewer.

You need to find a niche in the marketplace.
WHY THE GARDENING AND BOTANICAL ARTS BRAND FOR OTTAWA?

- Regional demographics – 9.6 million people live within 75 miles of Ottawa

- Popularity of gardening – one of the fastest growing hobbies. According to a 2007 survey, 71% of all U.S. households participate in one or more types of lawn and garden activities including 30% listing flower gardening alone as their favorite lawn or gardening activity.

- Uniqueness – No other city in the Midwest and only a few in the entire nation are pursing this brand.
Ottawa, Illinois
Branding, Development & Marketing Action Plan
Historic Restoration-Preservation
Façade Improvements
221 W. Main Street

before

after
Illinois River Road National Scenic Byway Kiosk
PARTNERSHIPS ARE IMPORTANT
IVCC Ottawa Satellite

Ottawa, IL
Ottawa Elementary School
Central School Flooding
LOOK TO FUTURE CHALLENGES

- Enhanced Broadband Access
THE END
Soil and Water Movement II: Sediment

**Water and Sediment Monitoring in the Illinois River Basin**
Timothy Straub
U.S. Geological Survey

**Sediment Movement in the Illinois River Basin**
Mike Demissie
Illinois Water Survey

**Channel Stability and Ecosystem Restoration and Assessments**
Laura Keefer
Illinois State Water Survey
Water and Sediment Monitoring in the Illinois River Basin

Timothy D. Straub and Gary P. Johnson
Hydrologists/Engineers
USGS  Illinois Water Science Center
Where is this?

a) Illinois River near Valley City
b) Illinois River near Chillicothe
c) Illinois River near Marseilles
Where is this?

a) Illinois River near Valley City
b) Illinois River near Chillicothe
c) Illinois River near Marseilles
Where is this?

a) Senachwine Creek near Chillicothe

b) Spoon River near Seville

c) Fox River at Dayton
Where is this?

a) Senachwine Creek near Chillicothe

b) Spoon River near Seville

c) Fox River at Dayton, and Ryan and Greg wonder why they work for the USGS?!?!
Water and Sediment Monitoring in the Illinois River Basin

- Needed to evaluate historical and current conditions, and plan and evaluate management alternatives
- Many agencies participate in funding or collecting data
- Presentation will focus on overall monitoring principles, the IMP, and USGS network
  - Streamflow/water monitoring/gaging
  - Sediment monitoring/gaging
So... what is a streamgage?
Illinois River At Valley City

Historical Peak: 28.61’ ft on 05/26/1943

Official Flood Stage: 11.00’
Real-Time Streamgages

Explanation

- **Wet**
  - ≥ 90th percentile
  - 75th - 89th percentile
  - 25th - 74th percentile
  - 10th - 24th percentile
  - < 10th percentile

- **Dry**
  - Not ranked
- Real-time data at il.water.usgs.gov
- The USGS operates over 180 streamgages in the State of Illinois
- Cooperation with over 30 local, State, and Federal Agencies
Everything you need to know about streamflow measurement and calculation: USGS WSP 2175 Vol. 1 & 2
1st Streamgage

- Rio Grande River near Embudo, NM
  - 1889

Early IL River Streamgage

- Illinois River at Marseilles
  - Peaks: 1892; 1894-1898; 1900; 1905-Present
  - Continuous Streamflow: 1920-Present

USGS
Progression of stage sensing:

- Stilling Well
- Pressure Transducer

USGS
Discharge must be measured over a range of stages.
Uses of Streamgaging Network

- Flood forecasting
- Navigation
- WWTP’s
- Industry
- Bridge design
- Flood elevations
- Recreation
- Irrigation
Additional Streamgage Options

- Raingages
- Water-quality measurements and sampling devices INCLUDING SEDIMENT
- Velocity-sensing devices
Sediment must be measured over a range of stages
Everything you need to know about sediment measurement and calculation
Intermittent USGS Sediment Gages: 1972-Present

IL River at Valley City: longest continuous record (1980-present)
Flux of USGS Sediment Gages 1972-2003

- Network unstable until 2003
- IMP awareness helped in stabilizing
- 2010 budget cuts to Corps 519 program may force cutbacks
CURRENT USGS NETWORK

Streamflow (>180)  Sediment (15)

EXPLANATION

- USGS Current Streamflow Stations

EXPLANATION

- Illinois Sediment Sites
Current Sediment Gaging Funding Agencies

- Rock Island Corps of Engineers
- St. Louis Corps of Engineers
- Illinois Environmental Protection Agency
- U.S. Environmental Protection Agency
- Illinois State Water Survey
- Illinois Department of Natural Resources
- Lake County Forest Preserves
- Lewis and Clark Community College
- Bloomington Parks and Recreation
Real-Time Water Quality Gages
http://nrtwq.usgs.gov/
Real-Time Streamflow and Sediment Concentration in Kansas
Velocity sensors
(Index-Velocity ratings)
Silt-and-clay vs Backscatter Attenuation - Colorado River

\[ y = 1345.728x \]

\[ R^2 = 0.996 \]
Moving Forward Potential
Sediment Movement in the Illinois River Basin

by
Mike Demissie, Director
Illinois State Water Survey
Institute of Natural Resource Sustainability
University of Illinois
Champaign, IL
Integrated Management Plan for the Illinois River Watershed

- Recommendation 12 - Improve monitoring of water and sediment of Illinois streams:
  - Involve units of local, state, and federal governments that need water and sediment data.
  - Evaluate the quality and locations of current water and sediment monitoring and data collection.
  - Improve the ability to evaluate and recommend reliable water and land use management options.
Data Sets Evaluated

- USGS – Sediment Budget
- Benchmark Sediment Network – long term trend
- Illinois River CREP – targeted small watersheds monitoring
Sediment Budget of the Illinois River

Illinois State Water Survey
Sediment Rating Curve for Mackinaw River at Congerville
Annual Sediment Yield Equations for Tributary Streams in the Illinois River Valley
Sediment Inflow, Outflow, and Deposition

![Graph showing sediment inflow, outflow, and deposition from 1981 to 2000. The graph includes data for Sediment Inflow, Outflow, and Deposition.]
Sediment Budget of the Illinois River Valley

Sediment Input: 12.1 million tons per year

Sediment Deposition within the Illinois River Valley: 6.7 million tons per year

Sediment Outflow at Valley City: 5.4 million tons per year
Illinois River Sediment Budget Summary

- Average annual sediment delivery to the Illinois River valley – **12.1 million tons**
- Average annual sediment discharge at Valley City – **5.4 million tons**
- Average annual sedimentation – **6.7 million tons**
- Percent deposited – **55 percent**
- The Spoon and La Moine Rivers had the highest sediment yield rates for the period of analysis.
- The sediment budget for the 1980-2000 period will serve as a basis for measuring our progress towards reducing the sediment delivery to the Illinois River valley.
ISWS
Benchmark Sediment Monitoring Program (BSMP)

- 1980 - ISWS established the Illinois Benchmark Sediment Monitoring Network (BSMN) consisting of 50 monitoring stations throughout Illinois

- Currently there are 15 active monitoring stations

  - Goal: Develop comprehensive, long-term database of suspended sediment transport to provide a means for investigating and quantifying long-term trends that may be occurring in Illinois watersheds.
Original 1980 Stations
(The Grand Plan)
Current Stations
### Illinois Benchmark Sediment Network Stations

<table>
<thead>
<tr>
<th>ISWS number</th>
<th>USGS number</th>
<th>Station name</th>
<th>Period of record</th>
<th>Water years</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>05437500</td>
<td>Rock River at Rockton</td>
<td>1981-2005</td>
<td>25</td>
</tr>
<tr>
<td>122</td>
<td>05555300</td>
<td>Vermilion River near Leonore</td>
<td>1984-2005</td>
<td>22</td>
</tr>
<tr>
<td>123</td>
<td>05542000</td>
<td>Mazon River near Coal City</td>
<td>1981-1997, 2002-2005</td>
<td>21</td>
</tr>
<tr>
<td>124</td>
<td>05527500</td>
<td>Kankakee River near Wilmington</td>
<td>1983-2005</td>
<td>23</td>
</tr>
<tr>
<td>242</td>
<td>05584500</td>
<td>La Moine River at Colmar</td>
<td>1981-1988, 1993-2005</td>
<td>21</td>
</tr>
<tr>
<td>245</td>
<td>05585000</td>
<td>La Moine River at Ripley</td>
<td>1984-1990, 1993-2005</td>
<td>20</td>
</tr>
<tr>
<td>249</td>
<td>05572000</td>
<td>Sangamon River at Monticello</td>
<td>1981-2005</td>
<td>25</td>
</tr>
<tr>
<td>378</td>
<td>03612000</td>
<td>Cache River at Forman</td>
<td>1981-2005</td>
<td>25</td>
</tr>
<tr>
<td>513</td>
<td>NA</td>
<td>Cache River at Ullin</td>
<td>1995-2005</td>
<td>11</td>
</tr>
</tbody>
</table>
BSMN Station
25-Year Mean Suspended Sediment Yield (tons/mi^2)
Trends Analysis

- The objective was to investigate any trends in suspended sediment transport that may have occurred in Illinois streams based on 25 years of data collection in the Illinois Benchmark Sediment Monitoring Network.

- Trend analyses were conducted for annual mean discharge, annual sediment load, and annual mean sediment concentration.
ISWS# 122: Vermilion River near Leonore, IL

ISWS #124: Kankakee River near Wilmington, IL
y = -8.1344x + 17039
R² = 0.0232

y = -3.2461x + 7E+07
R² = 0.1099

y = -33.81x + 67993
R² = 0.3318

ISWS# 229: Spoon River at London Mills, IL

ISWS #229: Spoon River at London Mills, IL
### Trend Analysis

<table>
<thead>
<tr>
<th>ISWS number</th>
<th>Two-sided p values</th>
<th>Number of water years</th>
<th>Trends</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\tau_D$</td>
<td>$\tau_{SL}$</td>
<td>$\tau_{SC}$</td>
</tr>
<tr>
<td>Pecatonica River at Freeport</td>
<td>0.6243</td>
<td>0.2629</td>
<td><strong>0.0802</strong></td>
</tr>
<tr>
<td>Rock River at Rockton</td>
<td>0.9579</td>
<td>0.1131</td>
<td><strong>0.0645</strong></td>
</tr>
</tbody>
</table>

| Vermilion River near Leonore | 0.5661  | 0.1742  | 0.139  | 21  | $\leftrightarrow$ | $\leftrightarrow$ | $\leftrightarrow$ |
| Mazon River near Coal City | 0.2241  | 0.0079  | **0.017**  | 16  | $\leftrightarrow$ | ↓ | ↓ |
| Kankakee River near Wilmington | 0.381  | 0.0039  | 0.0048  | 20  | $\leftrightarrow$ | ↓ | ↓ |
| Kankakee River at Momence | **0.0641**  | 0.3727  | 0.2437  | 12  | ↓ | $\leftrightarrow$ | $\leftrightarrow$ |
| Spoon River at London Mills | **0.0814**  | 0.0019  | 0.0064  | 18  | ↓ | ↓ | ↓ |
| La Moine River at Colmar | 0.2629  | **0.0301**  | **0.0424**  | 19  | $\leftrightarrow$ | ↓ | ↓ |
| La Moine River at Ripley | 0.2079  | 0.0064  | 0.0209  | 19  | $\leftrightarrow$ | ↓ | ↓ |
| Sangamon River at Monticello | 0.6374  | **0.0185**  | **0.0092**  | 24  | $\leftrightarrow$ | ↓ | ↓ |
| Kaskaskia River at Vandalia | 0.8215  | 0.535  | 0.3377  | 22  | $\leftrightarrow$ | $\leftrightarrow$ | $\leftrightarrow$ |
| Silver Creek near Freeburg | 0.7917  | **0.0394**  | **0.0645**  | 23  | $\leftrightarrow$ | ↓ | ↓ |
| Little Wabash River at Carmi | 0.9212  | 0.1376  | **0.0011**  | 15  | $\leftrightarrow$ | $\leftrightarrow$ | ↓ |
| Cache River at Foreman | 0.5912  | **0.0004**  | **0.0001**  | 25  | $\leftrightarrow$ | ↓ | ↓ |
| Cache River at Ullin | 0.9170  | 0.2515  | **0.0049**  | 11  | $\leftrightarrow$ | $\leftrightarrow$ | ↓ |
Trend Results

- Trend analyses conducted using Kendall $\tau$ coefficients suggest that (at 80% confidence):
  - mean annual discharge decreased at 6 of the 15 stations
  - mean annual load and mean annual concentration decreased at 11 of the 15 stations
  - discharge, sediment load, and sediment concentration decreased at 5 of the 15 stations

- At the 90% confidence limits,
  - No stations showed a decreasing trend in discharge
  - 8 stations showed a statistically significant decreasing trend in both annual mean load and annual mean suspended sediment concentration.
Trends in Streamflow and Precipitation: Illinois River

Annual Precipitation 10-year moving average (inches)

Annual Streamflow 10-year moving average (inches)

Illinois River at Peoria-Kingston Mines

- Precipitation
- Streamflow
Illinois River Conservation Reserve Enhancement Program (CREP)

- Joint federal/state program with the goal of improving water quality and wildlife habitat in the Illinois River Basin
- Voluntary program
- Land retirements, easements & conservation practices
- The two main goals are:
  1. “Reduce the amount of silt and sedimentation entering the mainstem of the Illinois River by 20 percent.”
  2. “Reduce the amount of phosphorous and nitrogen in the Illinois River by 10 percent.”
CREP Programs

- **USDA-FSA Program (Federal)**
  - Eligible acres enroll for 15-year conservation easements

- **Illinois state option**
  - Extend federal contract to 15-year, 35-year, or permanent conservation easements

- **Eligible agricultural land**
  - Within 100-year floodplain
  - Highly erodible land (HEL) with erodibility index \( \geq 12 \)
  - Adjacent to riparian areas
  - Wetlands farmed under natural conditions or prior converted wetlands
CREP Contracts for Court and Haw Creeks in the Spoon River Watershed
Evaluation Methods

- Monitor selected watersheds for changes in:
  - Land use
  - Streamflow
  - Sediment transport
  - Nutrient transport

- Develop tools to assess and evaluate the effectiveness of CREP in reducing sediment & nutrient delivery to the Illinois River
  - Development of watershed models
  - Sediment and nutrient budgets
  - Statistical tests-analysis of covariance (ANCOVA)
## CREP Intensive Monitoring Stations

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Name</th>
<th>Drainage Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Spoon River</strong></td>
<td></td>
</tr>
<tr>
<td>301</td>
<td>Court Creek</td>
<td>66.4 sq mi / 172 sq km</td>
</tr>
<tr>
<td>302</td>
<td>North Creek</td>
<td>26.0 sq mi / 67.4 sq km</td>
</tr>
<tr>
<td>303</td>
<td>Haw Creek</td>
<td>55.2 sq mi / 143 sq km</td>
</tr>
<tr>
<td>305</td>
<td>Swan Creek</td>
<td>98.1 sq mi / 254 sq km</td>
</tr>
<tr>
<td>306</td>
<td>Cedar Creek</td>
<td>146.2 sq mi / 379 sq km</td>
</tr>
<tr>
<td></td>
<td><strong>Sangamon River</strong></td>
<td></td>
</tr>
<tr>
<td>201</td>
<td>Panther Creek</td>
<td>16.5 sq mi / 42.7 sq km</td>
</tr>
<tr>
<td>202</td>
<td>Cox Creek</td>
<td>12.0 sq mi / 31.1 sq km</td>
</tr>
</tbody>
</table>
CREP Intensive Monitoring Data

![Graph showing suspended sediment load from 2000 to 2007 for Panther Creek (201) and Cox Creek (202).]
CREP Intensive Monitoring Data

![Bar chart showing suspended sediment load (tons) from 2000 to 2007 for Court Creek (301), North Creek (302), and Haw Creek (303).](image-url)
Variability of sediment yield per inch of runoff for CREP monitoring stations
Summary

- Availability of long-term data is extremely useful for assessing changes in watersheds: land use, hydrology, water quality, sediment, and habitat.

- We can document and detect change over time – however, it should be acknowledged that it takes time to see some of these changes and thus quick assessments are not reliable.

- With the collection of the appropriate data and the proper use of watershed models and statistical methods, we can evaluate the effects of watershed projects successfully.
Thank You!

http://ilrdss.sws.uiuc.edu
Channel Stability and Ecosystem Restoration and Assessments

Laura L. Keefer$^1$
William White$^1$
Bruce Rhoads$^2$

University of Illinois at Urbana-Champaign

$^1$Illinois State Water Survey, Institute for Natural Resource Sustainability
$^2$Department of Geography
Overview

- Integrated Management Plan for the IRB
- Recommendation #10: Stabilize unstable stream channels

  - WHERE WERE WE
  - WHERE ARE WE NOW
  - WHERE DO WE GO FROM HERE
(1904-1999) 4.09 million tons
43,058 tons/year
1,537 tons/acre/year
• 12.1 millions tons/year delivered
• 55% trapped (5.4 million/tons/yr)
Where were we?

- Perception that streambank erosion was inherently bad and must be controlled.
- Streambank erosion was local scale – treat symptom.
- Meandering streams naturally erode banks.
- Definition: unstable ... depends!
  - Engineering: magnitude of erosion generates public concern.
  - Geomorphological: abrupt, episodic, progressive changes.
- Balance of sediment inputs/outputs.
Stabilize stream channels

- 1997 Integrated Management Plan for the IRB
- 6 Recommendation Groups
  - Total of 34 Recommendations
- Soil & Water Movement (Rec. #7-13)
  - Hydrology & Hydraulics Action Team
- Recommendation #10: Stabilize unstable stream channels (urban and rural)
Recommendation #10

- Stabilize unstable streams in rural and urban areas as identified by rate or magnitude of erosion yields
  - Establish assessment criteria for identifying unstable streams based primarily on scientific info on geomorphology of stream system (network/watershed)
  - Conduct site investigations to generate info on instability causes
  - Formulate ‘holistic’ management strategies (combine natural and engineered stabilization techniques)
  - Initiate low-cost, long-term monitoring at selected sites to evaluate effectiveness of stabilization techniques
Where are we now?

- Expand to system-wide investigations
  - Stream Channels and associated watershed
- Observed changes in erosion and sedimentation are a result of various management practices designed to meet societal needs
  - Altering flow and habitat availability through impoundment, channelization, leveeing, and water diversion
  - Land management practices alter transport capacity
  - Temporal and spatial impacts on the physical and biological processes that define a given ecosystem
Where are we now?

- Multi-scale, multi-disciplinary, & collaborative
  - Hydrology/hydraulics; channel geomorphology; geology, climate; aquatic habitat & biology; land management activities/practices
- Long-term monitoring
- River restoration is emerging field with likely knowledge gaps that may
  - Need investigations to better understand ecosystem responses to restoration practices
  - Studies to identify the underlying processes that will aid in understanding the ecosystem
IRB Restoration Comprehensive Plan

- Provide vision, goals, objectives, desired future, and recommended plan to restore the ecological integrity of the IRB system.
- Restore and conserve natural habitat structure and function.
- Framework to guide identification, selection, study and implementation of restoration projects, monitoring and adaptive management activities, and further system investigations.
- Integrated management plan provides context for system-wide ecosystem restoration goals.
IRB Restoration Comprehensive Plan

- Long-term Monitoring Plan (Geomorphic, Ecological, Hydrologic and Sediment)
  - Main Stem Level
  - Sub-basin Level
  - Project Level
Watershed Assessment Framework

- Describe and document patterns, processes, and functions within a watershed system to assist in understanding past and present conditions
  
  - Compare and prioritize watersheds
  - Establish a reference watershed
  - Rapid watershed assessment
  - Watershed characterization
  - Integrated assessment and evaluation
  - Project recommendations
Assessment Watershed Priority

- Sediment budget information
- Location in the basin
- Biologically significant (Resource Rich) areas and ecosystem concerns
- Level of support - including recommendations from:
  - IL River Basin Ecosystem Restoration Regional Teams
  - Conservation 2000 Ecosystem Partnerships
  - Regional planning commissions
  - Watershed planning groups
  - Other local coordination groups, etc...
- Economic Limitations and Opportunities
Example of spatial density of rapid assessment sites
Example of integrated data analysis using watershed characteristics, geology, biology, and rapid channel data
• Example of integrated data analysis
Example of multi-disciplinary collaboration using integration of existing and rapid geologic, biologic, geomorphic datasets to identify reaches for more investigation and possible projects.
Where do we go from here?

- Comprehensive approach to stream management that includes geomorphological processes linked to ecological and water quality concerns
- Understand the need for balance of sediment transport (input/output)
- Some banks need to erode at reasonable rates to contribute balance of sediment
- Strategic implementation of restoration projects based on assessments of systemic erosion processes
Where do we go from here?

- Need investigations to better understand ecosystem responses to restoration practices
- Studies to identify the underlying processes that will aid in understanding the ecosystem
Thank you
What a well attended and informative few days we’ve had here in Peoria during this, the 12th Biennial Governor’s Conference on the Management of the Illinois River System. Our theme for this 2009 conference Looking Back—Moving Forward was given clearer focus by virtue of the thoughtful and energetic presentations from a whole host of talented individuals. I believe this conference helped, and will continue to help nurture professional relationships and build even stronger synergies among all stakeholders long into the future.

Successes have been numerous over the last 24 years since the first Governor’s Conference on the Management of the Illinois River System and particularly in the last 12 years since the implementation of the Integrated Management Plan for the Illinois River Watershed. The Integrated Plan detailed 34 separate recommendations and steps for implementation. Past Lieutenant Governor Dr. Bob Kustra stated in January 1997 when the Integrated Plan was released to the public that “carrying out these 34 recommendations will go a long way toward saving the Illinois River for future generations and in the future we must monitor our progress and reevaluate our efforts, and we certainly must never forget just how important and fragile this river is.”

Successes have been realized and we’ve had an opportunity to hear about, and see documentation on, many of these successes at this conference. You should all be proud of your accomplishments.

I believe the continued collaboration among so many talented individuals here this week bodes well for the future. I anticipate seeing many, many more successful and innovative strategies, programs, and projects that support sustainability of the Illinois River system. So remember, many more success stories about enhancing and sustaining the Illinois River system will soon be written and citizens will be aware of these success stories because they will see the results, not just by hearing about them or reading plans, but by observing what is happening “in-the-water” and “on-the-ground.”

The Conference Planning Committee consisted of over forty people including scientists, researchers, policy makers and policy advisors, practitioners, and educators representing local, state, and federal agencies and constituency groups along with the specific talents of non-governmental organizations and volunteers. The Planning Committee members are grateful to the Illinois River Coordinating Council, keynote speakers, exhibitors, interactive digital technology session facilitators, conservation tour coordinators, those participating in the plenary sessions, concurrent sessions, moderators, and all who played a major role at this conference. Each of them helped us “look back at where we once were and understand how we really have been moving forward.”
My hope is that we are now more familiar with the Integrated Management Plan for the Illinois River Watershed and how this plan provided a necessary framework for future restoration of such a major waterway system. The Plan served as a “benchmark” for several successful planning and implementation efforts and to this day still helps us appreciate where we’ve been, assess our most recent accomplishments, and set (and for some of us to perhaps re-set or re-align), our plans, strategies, and projects to help ensure future progress in building capacity to sustain the Illinois River and its watershed.

We are grateful to all of our Sponsors for their financial and in-kind contributions to this conference. Special heartfelt thanks to Kim St. John and Bob Frazee, my Co-Chairs, for their long-time dedication to the Illinois River system and to this conference. Kim is one of the easiest people to get along with, and while extremely dedicated as I’m sure you are aware, always one of the hardest workers and a pleasure to work with. Bob Frazee is stepping down as a Co-Chair of this conference after being at the helm as a Conference Chair for 24 years. His special knowledge will be irreplaceable. We wish Bob the best and many happy days fishing with his children and grandchildren.

We are most grateful to you, the attendees, for having the interest and taking the time out of your busy schedules to attend and make this such a successful gathering; especially during such an economically troublesome time. We were thrilled to have your active participation and hope the opportunity to network gave you some new contacts and ideas to implement further successes.

The 2009 Governor’s Conference on the Management of the Illinois River System is now officially adjourned. Thank you for helping us on our little journey this week. We stopped to take a Look Back and in so doing realized how much has recently been accomplished. Now it’s time for us to go forth—to Move Forward and create even greater SUCCESS STORIES!

Thank you!
2009 Governor's Conference on the Management of the Illinois River System
"Looking Back, Moving Forward"

Photos by Jon Rodsater and Scott Wallace

October 20, 2009

Jason Beverlin at Emiquon with Conservation Tour Group (Photo Credit: Jon Rodsater)

Dixon Mounds (Photo Credit: Jon Rodsater)

Conservation Tour -- Mike Wiart at Dickson Mounds (Photo Credit: Scott Wallace)

Wind farm on Conservation Tour (Photo Credit: Scott Wallace)

Gov. Pat Quinn, Ray LaHood, Bob Frazee receiving Rock Tribute Award (Photo Credit: Jon Rodsater)

Ray LaHood with Bob Frazee, Bill White, and Kimberly St. John (Photo Credit: Jon Rodsater)

Quinn addressing the IRCC (Photo Credit: Jon Rodsater)

Kim St. John, Bob Frazee, Gov. Pat Quinn and Bill White (Photo Credit: Jon Rodsater)

Ray LaHood addressing the Illinois River Coordinating Council. (Photo Credit: Jon Rodsater)
Bob Frazee and Doug Blodgett accepting the TNC Frank Bellrose Award (Photo Credit: Jon Rodsater)
October 21, 2009

Conference Registration (Photo Credit: Jon Rodsater)

Opening Session (Photo Credit: Jon Rodsater)

Senator Koehler (Photo Credit: Jon Rodsater)

Bob Kustra (Photo Credit: Jon Rodsater)

Plenary Session and Speaker/Moderator (Photo Credit: Jon Rodsater)

Registration Crew (Photo Credit: Jon Rodsater)

Nancy Erickson and Panel Discussion (Photo Credit: Scott Wallace)

Kim St. John, Conference Co-Chair (Photo Credit: Jon Rodsater)

Governor's Conference Tribute (Photo Credit: Scott Wallace)
Reception at the Gateway Building (Photo Credit: Scott Wallace)

Evening activities at the Gateway Building (Photo Credit: Jon Rodsater)

Evening entertainment (Photo Credit: Jon Rodsater)
October 22, 2009

Steven Havera, Bill White and Bob Frazee
(Photo Credit: Jon Rodsater)

Lunch Speaker -- Zalaznik (Photo Credit: Jon Rodsater)

Bill White, Conference Co-Chair, delivering closing comments (Photo Credit: Jon Rodsater)
STATE OF ILLINOIS

EXECUTIVE DEPARTMENT

Proclamation

WHEREAS, the Illinois River is a vital component of our state’s geography, history, economy, and ecology, and
WHEREAS, many of its attributes are threatened as a result of the cumulative effects of human activities that have significantly altered the Illinois River system,
WHEREAS, our state is embarking on an integrated approach to large river management and is working to a coordinated and continuous manner for the river, and
WHEREAS, the implementation of the Illinois River coordinating council, the Conservation Reserve Enhancement Program, the Partners for Conservation Program, the Illinois River 2020, the Open Lands Trust fund, the “Mad to Ponds Program,” the Landscape Incentive Program, the Illinois Fish and Wildlife Action Plan, the Illinois Conservation Stewardship Program, the Illinois Conservation Climate Initiative, the Stream and Watershed Assessment and Restoration Program, and the Farm Bill Conservation Title are important milestones in efforts to protect the resources of the Illinois River, and
WHEREAS, the theme of the 2009 Conference on the management of the Illinois River System is “Looking Back, Moving Forward,” and
WHEREAS, the conference will be taking place October 20-22, 2009 at the Black Hawk Marquette in Peoria, Illinois.

THEREFORE, I, Pat Quinn, Governor of the State of Illinois, do hereby proclaim October 2009 as ILLINOIS RIVER MANAGEMENT MONTH, and encourage citizens to recognize the economic, recreational, social, and environmental benefits of conserving and properly utilize the resources of the Illinois River Basin.

In Witness Whereof, I have hereunto set my hand and caused the Great Seal of the State of Illinois to be affixed.

Done at the Capitol, in the City of Springfield, this 9th day of March, in the Year of Our Lord two thousand and ninetynine, and of the State of Illinois one hundred and ninetynine.

[Seal]

Pat Quinn
GOVERNOR

[Signature]
SECRETARY OF STATE
Thank you to all of our current Sponsors for your involvement in the 2009 Governor’s Conference on the Management of the Illinois River System.

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**October 20 - 22, 2009**  
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