

the great

WATERSHED

project



The Great Watershed Project

Science Advisory

Principal Investigators

Arnold van der Valk – Iowa State University/ University of Florida

Michael Anderson – Canadian Director, Institute for Wetland
and Watershed Research, Ducks Unlimited

Frank Rohwer – Louisiana State University

Doug Wilcox – The College at Brockport: State University of New York

Patricia Chow-Fraser – McMaster University

Gordon Goldsborough – University of Manitoba

Key Contributing Scientists

Paul Keddy – Professor Emeritus, Ecology

Lawrence Glenn – Dir. Kissimmee River Restoration Project

William Crumpton – Iowa State University

John Downing – Iowa State University

Matt Helmers – Iowa State University

Karen McKee – United States Geological Survey

Clint Willson – Louisiana State University

John Andrew Nyman – Louisiana State University

Xiaodong Zhang – University of North Dakota

Martin Hamel – University of Nebraska

John Farrell - Thousand Islands Biological Station

Todd Thompson - Indiana Geological Survey

Dale Gawlik - Florida Atlantic University

Greg Grabas - Environment Canada

David Unsell - South Florida Water Management District

Cooperating Organizations and Agencies

United States Army Corps of Engineers (Mississippi Division/ Florida)

Ducks Unlimited (Canada & US)

Delta Waterfowl (Canada & US)

Environmental Working Group (US)

Gulf Restoration Network

United States Geological Service (USGS)

Fish and Wildlife Service (US)

Louisiana Department of Wildlife and Fisheries

The Nature Conservancy

ALUS (Alternative Land Use Services)

Iowa Flood Center

General John Peabody, Mississippi Watershed

Michael Forsberg, National Geographic Photographer

Michael Grunwald, Time Magazine

Clive Butcher Gallery, Big Cypress Swamp

Jerry Kenny, Director, Platte River Recovery

Audubon Society Nebraska

GORDON GOLDSBOROUGH



In 2004, Gordon Goldsborough, Biologist at the University of Manitoba, penned a paper on the death of the once-legendary Netley-Libau Marsh, the largest inland wetland in the western hemisphere. Its demise is one of the largest losses of plant and animal life the continent has ever seen.

From 1996 to 2010, Gordon headed the Manitoba Field Station at Delta Marsh, a place where some of the most significant discoveries in wetland science were made. Here, Gordon not only conducted research, he encouraged thousands of students to come face to face with the marsh. Gordon also became a member and then

president of the Manitoba Historical Society. Included in his work was the archiving of every photo of the Jimmy Robinson Lodge, a place of legend among sportsmen around North America.

But Gordon discovered that understanding the natural world and preserving a historic past was neither enough to save Delta nor the neighbouring Netley-Libau Marsh. With this in mind, he met with Kitson Vincent from the Murphy Foundation, who agreed to fund a one-year study focused on answering a monumental question: What would it take to bring these two marshes back to health?

While working on this study with such experts as Dale Wrubleski, Gordon continued to work to preserve wetlands in Manitoba. He was a key figure in the landmark CBC Nature of Things documentary *Save My Lake*, which has now been viewed by over 1.5 million Canadians. Gordon is responsible for field testing new carp exclusion technology that could kickstart restoration. He is also working to re-establish a teaching and research facility at Delta Marsh after the devastating flood of 2011.

ARNOLD VAN DER VALK



Could the great wetlands of Delta and Netley possibly be brought back to their former bounty? To answer the question, two of world's greatest wetland scientists were brought in: Doug Wilcox and Arnold van der Valk.

Arnold van der Valk began his career at Delta Research Station and was a key figure in the landmark Marsh Ecology Research Program (MERP), one of the longest and most significant inquiries into the role of water fluctuations in wetland health. Since then, his research interests have expanded globally, with visiting professorships at four universities

(in the Netherlands, Australia, Venezuela and Florida) along with significant research into the great wetlands of Africa. An expert of restoration and ecological history, Arnold is also a visiting fellow at the Florida Center for Environmental Studies, where he is researching the pioneering conservation work of Aldo Leopold and Marjory Stonman Douglas. In Florida he also is collaborating with researchers on a Tree Island Restoration Study, which builds on the pioneering work of MERP to understand how water flow and fluctuations can bring back to life Tree Islands, the ecological cornerstones of many wetland complexes from Manitoba to Florida.

DOUG WILCOX



Doug Wilcox, Professor of Wetland Science at the College at Brockport, State University of New York, has spent his life studying wetland plants. Wilcox has focused on the cattail, a plant that has colonized much of Manitoba's marshes to the detriment of the waterfowl and fish, which need more diverse vegetation to survive. Formerly a senior scientist at the US Geological Survey, and now holding the prestigious Empire Innovation Chair of Wetland Science, Doug has devoted his life to restoring marsh plant communities. For the last decade, he has been pioneering and field testing techniques, which, with the right ongoing management, can reverse cattail domination and restore wetland diversity in as little as two years.

Doug together with Arnold van der Valk spent more than a month assessing the current situation at Delta and Netley. From boat, land and air, they surveyed the marshes to answer the fundamental question: was restoration even possible? They concluded that it was indeed possible to bring these wetlands back to the productivity that they once enjoyed at the turn of the century. But to do so, however, would not mean just restoring the wetland, it would mean engaging the entire watershed and finding new ways to involve the public with wetland health. It would also mean incorporating the lessons learned from other successful restoration projects in Florida, the Platte River, the Great Lakes and elsewhere.

BRUCE BATT and HENRY MURKIN: THE 'MERP' STORY



BRUCE BATT: Chief Biologist at Ducks Unlimited, Bruce has worked in waterfowl research and management in Canada and the US for 30 years. Batt had the experience of working at Delta Research Station on the Marsh Ecology Research Program (MERP) in the days when waterfowl research was giving birth to the newer field of wetland science. Batt explains how experiments at MERP led to the discovery of the importance of wet and dry cycling for the health of a wetland, and how from studying the duck, science began to unravel the mysteries of the watershed.



HENRY MURKIN: The National Director of Conservation for Ducks Unlimited Canada, Murkin grew up hunting in Manitoba's Netley Marsh, a place he calls 'the centre of duck universe'. Through his long career, Murkin grew to understand that the future of ducks depended on the habitat that supports them. For Murkin, MERP was instrumental in moving science from studying just the duck to studying the habitat and pulling back to the watershed as a complex and dynamic system that operates on both a microscopic and landscape level.

THE IOWA STORY



JOHN DOWNING: A lake scientist at the top of his field, Iowa State University limnologist John Downing studies Iowa's lakes because he believes they represent the future for the whole continent. Choked with an often-toxic organism called cyanobacteria, each lake reveals the 'fingerprints' of health of its watershed. When fertilizer run-off from surrounding agriculture surges into a lake, it allows the cyanobacteria to out-compete all the other organisms and the entire food chain of the lake suffers. A restoration expert, Downing shows how there is no point restoring a lake without addressing its watershed.



BRETT LORENZEN: A Capitol Hill lawyer turned ardent conservationist, Lorenzen took us on a tour to sites that exemplify the land use issues in Iowa. The corn and soybean monoculture has led to high soil erosion rates, localized flooding and the export of nitrogen and phosphorus from fields into area waterways.



LAKE KEOMAH: This lake has been completely colonized by cyanobacteria. Shrouded in a bright green blanket with a ring of foaming blue chunks, the lake bubbles with methane from the decomposition of things that once lived in the lake.



STEVE ENSLEY: A toxicologist at Iowa State's College of Veterinary Medicine, Steve Ensley is an expert in the potential health hazards arising from the consumption of water with high levels of toxic cyanobacteria. In the summer of 2012, he investigated when a rancher lost 20 head of cattle in a few hours from a contaminated pond. A potent neurotoxin, cyanobacteria has been known to kill livestock, dogs - and in one case a teenage boy - with just a few mouthfuls.

THE IOWA STORY



BILL MANKSE: A second-generation drainage tile installer, Bill recounts how advances in technology have allowed Iowa to achieve maximum farming productivity from the water-sodden land settlers discovered in the 1800s. Today Bill uses the most advanced machinery, laying the same amount of tile in ten minutes that used to take a crew a full day to accomplish. He explains the reasons farmers opt for tiling and defends the practice as an essential part of the modern agricultural landscape.



TILING: Tile drainage makes it possible to drain and plant areas that were once wetland; tiling has removed up to 90% of wetlands in some Midwest areas. But, tiling has enormous benefit for farmers. In spring, vast networks of underground drainage tiles across prairie Canada and the American Midwest remove excess water from fields and allow farmers to plant earlier. Tiling also keeps soil moisture in check throughout the growing season, leading to consistently higher yields. But if not mitigated elsewhere, this rapid flow of water can also impact stream bank erosion and flood levels as well as carrying high levels of nitrogen and phosphorus into the waterways.



DES MOINES WATER WORKS: When water flows slowly through a wetland area, the nitrogen fertilizer gradually breaks down and turns into a harmless gas. However, Iowa has lost that natural movement, and 90% of its wetland spaces, allowing nitrogen-laden water to rush unimpeded into its rivers. In Des Moines, the local water utility service had to find a way to lower the nitrogen levels. First, they tried technology — a multimillion dollar facility — but mothballed it in favour of simple ponds that do nature's work better than any human technology. Now, as the water flows slowly through the treatment ponds, the nitrogen is filtered out by a natural – and cost-free – process.

THE IOWA STORY



CORN AND AGRICULTURE: A key objective of this documentary is to bridge the gap between cities and rural areas. Most of the land in North America is agriculture and any solution to our water challenges must involve farming communities. Visuals of row crop corn production provides contrast for the solutions that are highlighted by the Alternative Land Use Services programs highlighted later in this document.



COVER CROPS AND NO-TILL PLANTING: One of the easiest ways to keep more roots in the ground is to let harvested crops sit in the soil instead of being immediately plowed under. Their roots, although dead, do a remarkable job of holding soil in place while enriching it with nitrogen without the addition of chemical fertilizers. Alternately cover crops can amplify these results. It takes just minutes to seed a field by small aircraft, but the results last all season. These cover crops, usually winter rye or alfalfa, hold the soil in place through the winter which holds soil and nutrients on the field through the spring melt, instead of exporting it into area wetlands and waterways.

LAKE ONTARIO



DOUG WILCOX: Doug has spent his life trying to understand how and why cattails have taken over the shores of Lake Ontario, turning it into a monoculture — to the detriment of hundreds of birds, plants and animals. Water levels on Lake Ontario are currently controlled to the nearest foot. Consistently high water has promoted cattail growth at the expense of everything else. Even one natural dry season, if it was allowed to occur, could restore balance to the lake.



JOHN FARRELL: From his base on the Thousand Islands Biological Station, John Farrell has watched Lake Ontario's decline for decades. He's seen the number of northern pike drop in half, and the number of muskrats fall even further — so much so that there is nothing left to eat the cattail and prevent it from strangling the marsh. His research has unlocked the clues to the causes of these changes, and how both animals and fish might be returned to health.



TOM BROWN: Although well into his 80s, this retired US military infantryman is not about to stop his battle to restore the Lake Ontario's natural cycle. Tom remembers when muskrats were plentiful on the shores, when they were trapped and sold to New York restaurants as "marsh rabbit". Brown recounts how much things had changed when he returned home and saw his lake out of balance, with much of the ecological bounty gone.

LAKE ONTARIO



ROBIN-DAVIDSON ARNOTT: Robin takes us to one of the last remaining truly natural stretches of Lake Ontario, which has largely been encased in concrete and stone. He speaks of how the endless human quest to stop erosion is actually misguided and will only hasten the loss of our beaches. He offers practical tips for cottagers and other shoreline dwellers to stem erosion effectively, and explains how the grand system of beach building and sediment transportation really works.



BEA SCHERMERHORN: A lifelong resident of Lake Ontario and retired marina owner, Bea talks about some of the unintended consequences of turning a lake into a reservoir — including wild fluctuations in water levels that played havoc with her business and the lives of tens of thousands of recreational boaters.



PAT CHOW FRASER: The director of Life Science at McMaster University, Pat studies the impact of human populations on aquatic ecosystems. She regards non-point source pollution, also known as run-off, as one of the biggest challenges for lakes fringed with dense human populations. The more concrete we have around our lakes, the faster mucky water flows in and like an atomic winter, this cloudy water blocks sunlight and kills off marsh plants, with the effects rippling up the food chain. Pat explains how to stop this process — and why it is important to conserve undeveloped shorelines where they still exist.

LAKE ONTARIO



GREG GRABAS: While taking routine samples in the marsh for Environment Canada, habitat ecologist Greg Grabas stumbled upon something strange. It was a tiny, shrimp-like invertebrate that had no place in Lake Ontario, no place in any freshwater lake. Carried in by bilge water from shipping, it is one of hundreds of invasive species in the Great Lakes, but what makes it truly strange is that it is a salt-water creature, yet somehow is thriving. Some think the amount of salt dumped on winter roads is changing the salinity of Lake Ontario's coastal wetlands and allowing saltwater creatures to find a new home.



TODD THOMPSON: Geologist Todd Thompson is unlocking the secret history of the Great Lakes by investigating their formation during the last great ice age. Using sand from ancient beaches, some buried deep underground, Todd has been able to reconstruct the rise and fall of lake levels through thousands of years. What he has found is that the Great Lakes have risen and fallen over 60 years throughout their history, almost like clockwork. When plotted over time on a graph, this rise and fall looks almost like a heartbeat. This wet-dry cycle has kept the lakes, its beaches and its wetlands, vibrant and alive.



MUSKRATS: A key character in our Lake Ontario story, and in wetlands around North America, we were fortunate to capture incredible visuals of the muskrat while filming our canvasback ducks. We captured visuals of the muskrat chewing through cattail and hauling it through the water to build its lodge. This shows how muskrat populations can manage marsh vegetation when not chased away by lake regulation.

THE CANVASBACK STORY

The canvasback duck is our ambassador for the prairie pothole, one of the most important and least appreciated habitats in North America. No other creature is more dependent on the pothole — along with countless other wetland habitats as it flies south each year. By telling its story from arrival on the breeding grounds to its journey south, the canvasback will help illuminate the importance of these wetland worlds.



MICHAEL ANDERSON: No scientist knows more about the Canvasback than Mike Anderson, whose three-decade career in duck biology includes time at both Delta Waterfowl and Ducks Unlimited. Mike has shared his love of this legendary duck, and also advised on all aspects of its filming. His nest-finding and expert knowledge allowed crews to film hatches closer than ever before and accurately tell the story of this legendary bird for the first time.



NESTING AND THE HATCH: We have captured the definitive footage of a canvasback nesting and hatch. Pioneering camera technology allowed us to get closer than ever before to the nest, capturing incubation and hatching in full High Definition. The viewer literally feels a part of the hen's trials and tribulations as she maintains her lonely vigil over her eggs for weeks on end, and shepherds her clutch of hatchlings in their dangerous first days of life.



LEARNING TO FLY: We captured the young canvasbacks taking their first tentative flights, testing out the wings they will need for their first migration south. It is the start of a remarkable journey that will span all the major wetland habitats through the centre of North America: from the staging grounds of Winnipegosis, rest stops in Iowa and Missouri along the Mississippi Flyway and finally to the southern tip of America, Louisiana's Birdsfoot Delta where they overwinter with thousands of other waterfowl.

ALUS: ALTERNATIVE LAND USE SERVICES

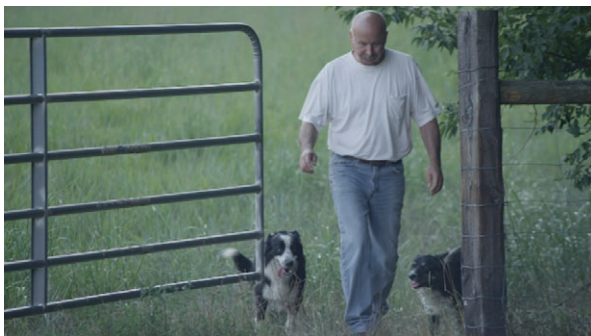
The Great Watershed Project focuses on science and innovative and pragmatic approaches to solving watershed issues. Alternative Land Use Services (ALUS), a community-led program designed by Delta Waterfowl, which has gained unprecedented momentum across Canada and is expanding into the US. The success of ALUS lies in the inclusive and common sense approach to conservation that empowers landowners to make a tangible difference in their local communities.



BOB BAILEY: As a former employee of Environment Canada, Bob was a key player in the design and implementation of the North American Waterfowl Management Plan. The Plan, though successful with conserving wintering and staging areas, missed the mark with protecting breeding habitat. Bob realized it was because of the way they had alienated landowners and farmers – a mistake he has learned from and has corrected with ALUS. Bob calls ALUS an ‘environmental Magna Carta’, a way to put stewardship of the environment into the hands of the people.



ROB OLSON: Former President of Delta Waterfowl Foundation and driving force behind ALUS, Rob Olson told us of his personal journey to understanding how conservation needs to work and how that led to the inception of ALUS. His own connection with nature came from a passion of hunting. He also spoke about the historical importance of the Delta Research Station, and what that centre of research excellence gave to the academy of ecological sciences.



BRYAN GILVESY: A rancher and president of Norfolk, Ontario ALUS, Bryan is an advocate for farmer-led conservation. As president, Bryan works with the community to establish tall grass prairie that buffers agricultural run off to local streams and provides nesting habitat. Operating since 2007, this community-led approach has planted more prairie grasses and revived more waterways in Norfolk than decades of government-run incentive programs. Bryan explained his involvement and how the tall grass prairie he planted helped his cattle survive the 2012 drought.



PAUL-BRITMAN RAPAI: In Norfolk County, third generation tree farmer Paul Britman Rapai is trying out ALUS for the first time. We filmed seeding of a tall grass prairie area on land where the soil has been depleted from over-farming. Paul explains how he thinks better land management will benefit both his farm and the local environment and why ALUS is a more common sense approach than government programs.



LAURA JACKSON: Though not formally with ALUS, Professor of Biology Laura Jackson's work with her students at the University of Northern Iowa provides scientific reasoning for the ALUS concept. She explained how all the challenges we have with water can be solved by one simple solution: finding a way to keep more roots in the ground. All of our modern crops are grown by seed, which means that they only have roots in the ground a portion of the year. Without roots in the ground, nutrients can travel into waterways, and precious soil can get washed away. Whether through buffer strips of native grass, or innovative perennial ethanol or even grain crops, getting more roots in the ground will do more than anything else to protect our watershed — and Laura has the proof.



UNIVERSITY OF NORTHERN IOWA: Laura Jackson's research team explained how it is the roots of plants that trap water and protect us from floods: they stop nutrients that destroy our rivers, lakes and wetlands, while building the rich soil on which our prosperity depends. Yet this world is invisible and unknown to most people. The goal has been to grow native prairie grasses and plants in large pots and then raising them from the soil to reveal their root structure. The roots are preserved and then incorporated into educational displays traveling around the continent. Their work allows us to see what the ALUS program achieves underground.

THE PLATTE RIVER RECOVERY



JERRY KENNY: A no nonsense engineer who returned home to head up the restoration of his beloved Platte River. Kenny heads up the on-going restoration work on the Platte River. The Platte River Recovery is a fast and successful restoration. The secrets of its success may well form the model for how restoration at Delta and Netley-Libau can proceed.



DON KRAUS: The General Manager of Central Nebraska Power, Kraus reveals a new and remarkable way to run a power company. Instead of using water only for people and agriculture, they have partnered with two other states to create an “environmental bank” of water. This bank is held in trust and used for environmental purposes whenever needed most. This includes restoring the highs and lows of water levels once common in nature, but now largely missing because of hydroelectricity.



JOHN HEASTON: A star college linebacker who returned to his native Nebraska after graduation because he missed the open spaces, Heaston, as Program Director for The Nature Conservancy, has devoted his life to preserving what is left of the state’s environmental history. Townspeople thought he was insane turning perfectly good cornfields into unprofitable prairie as he restored a massive stretch of native prairie along the river. But when a storm dumped 18 inches of rain in just one day – an event that normally would have flooded the banks and destroyed bridges for miles – the prairie sucked up every drop, and not one dollar of damage was done. No one thought John was that crazy anymore.

THE PLATTE RIVER RECOVERY



MIKE FORSBERG: Mike is often called the official photographer of the Great Plains, but he might as well be called its official philosopher as well. No one can speak so poetically about the importance of places like Platte River as Mike can, in good part because no one has spent so much time exploring this landscape. Mike gives his insights on the last great migration in North America – which draws 500,000 cranes, and thousands of visitors to the Platte each year. What attracts people to these birds? Why does it matter to keep such a spectacle alive? His answers to these questions tell us something deep about humankind.



BRAIDED RIVER: A unique wetland environment, the braided river design of the Platte is key to the survival of both the sandhill crane and the threatened sturgeon population. Its shallow, ever-shifting sandbars are the last such system in the lower 48 states. However, channelization and the creation of dams and reservoirs on other rivers such as the Missouri, has eliminated staging habitat for birds, and spawning habitat for countless fish.

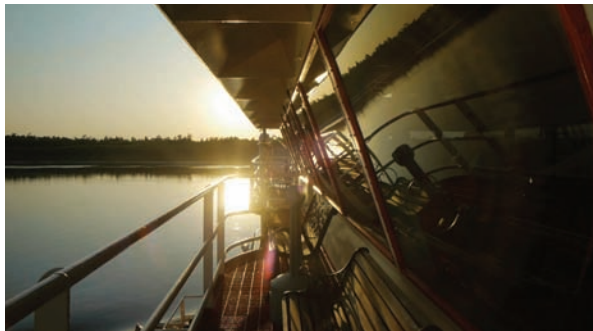


MARTY HAMEL: A biologist by training, but first and foremost a fisherman, Marty sometimes like to fish for sturgeon just to look into its eyes. It is like staring into pre-history. At a time when the closest human ancestor was some small rodent hiding from dinosaurs, these ancient fish were swimming our waterways, looking much the same as they do today. Marty's quest is to understand why these creatures, which have survived for over 200 million years, have gone nearly extinct in the last 100.

THE UNITED STATES ARMY CORPS OF ENGINEERS



GENERAL JOHN PEABODY: The General is the human embodiment of the pressures on the Mississippi. It must have enough water to carry people, not so much that floods them out, and still nurture a natural world that depends on it. The General takes the responsibility of balancing these needs seriously, while celebrating the value of the river he stewards. The Mississippi may be the third largest watershed in the world, but it is first in terms of productivity. It is also far more navigable than any other river of its size. It is what made and continues to make America great. One year after the Great Flood of 2011, the same river experienced historic lows, causing peril to transportation, the ecosystem and economy. How will the US Army Corps help the river meet the challenges of the future? General Peabody's development of an innovative 200-year plan seeks to find a sustainable balance between navigation, flood protection and the environment for America's future.



JOURNEY DOWN THE RIVER: Aboard the Motor Vessel Mississippi, the workhorse of the Army Corp of Engineers, we travelled from Missouri through Mississippi with General Peabody on his annual inspection trip of the river. Stopping for public consultations and assessing the reconstruction of levees damaged in the 2011 flood, this trip provides an intimate look at the day-to-day challenges the Corps must deal with to keep the Mississippi open for business while keeping citizens safe from floods.



DREDGE BOAT: For ships to pass the river, sand simply cannot be allowed to fall where it may; in fact, even with numerous dredges this year, water levels got so low that river traffic had to be stopped. The constant dredging and need for navigation, points to a key fact of life on the Mississippi. Because the shipping lanes must remain open, there is only so much ecological restoration that can be done on the Mississippi itself. To deal with the challenges of the future, one must deal with the watershed itself in the tributaries of the great river. On-going debate is guaranteed.

LOUISIANA



Coastal land loss is considered a crisis by federal and state authorities. Territory equal to the size of the state of Delaware has been lost since the 1930s. Traveling down the Atchafalaya River one sees islands that had just been formed by the river. Core samples were taken to understand how this happens and needs to happen at a larger scale.



LOUISIANA



FRANK ROHWER: Out in the Mississippi Delta in his hip waders, Frank Rohwer, Professor of Biology at Louisiana State University and new President of Delta Waterfowl is in his natural environment. Attracted by the bounty of biodiversity, the Delta is a wintering ground for millions of migratory birds.



ANDY NYMAN: A wetland ecologist at Louisiana State, Andy joined Frank Rohwer on a boat journey from Venice Louisiana to Pass A Loutre, the State park on the southern tip of the Birdsfoot Delta. Andy stumbled upon a small island of sand that had not existed during his last visit a few weeks earlier.



SHANE GRANIER: Shane, a Manager with the Louisiana Department of Fish and Game, took us by airboat to the last piece of land on the edge of the Birdfoot Delta before the Gulf of Mexico. On this tiny barrier island, Granier described how the land building force of the Mississippi meets the erosive power of the Gulf of Mexico and creates a most dynamic ecosystem.



MATT ROTA: Matt Rota, Director of Science and Water Policy at Gulf Restoration Network was able to give us a snapshot of the political and social side of the coastal wetland issue and how the management of the entire Mississippi River watershed is felt most of all in the Lower Mississippi and on the coast. Matt gave us a summation of the causes of the Dead Zone and how that impacts the local economy in Louisiana, as well as the long-term effects of Hurricane Katrina. He was interviewed on the spot where Katrina's storm surge swelled past a decimated wetland and into the Lower Ninth Ward, the epicenter of the storm's destruction.

LOUISIANA



ALEX KOLKER: A specialist in sediment at the Louisiana Universities Marine Consortium (LUMCON), Kolker is studying the areas where the Mississippi River Basin is still forming deltas. Along with Frank Rohwer, we traveled down the Atchafalaya River and observed land that was newly formed from the 2011 flood. Alex described the process of land formation and pulled core samples from a new island to show the layers of sediment that reveal the formation process.



JUDGE EDWARDS: A land manager in southwestern Louisiana, Judge was able to give us a first-hand witness account of what happens when coastal wetland degrades and then disappears. Judge took us out to a marsh that used to be vibrant, but is now slowly dying due to salt water intrusion from a nearby navigation channel. He spoke about how the land loss impacts the livelihood of people who live on the Gulf Coast.



KAREN MCKEE: A research ecologist specializing in coastal wetlands, Karen was able to sum up the process of how the coastal wetlands have been formed over centuries and how they are now disintegrating because of the changes made to the river and the watershed in general. She also described her personal experience of having worked in coastal areas that have now disappeared.



CLINT WILLSON: An environmental engineer at Louisiana State, Clint described how the hydrology of the Mississippi River has been engineered and what the impacts have been to the way the river runs. He also described the work that they do at the university to look at where the river would have the best chance of rebuilding land if river diversion projects were created using the physical model pictured here. He also works with a Coastal Sustainability Lab at LSU that is reimagining the coast from an environmental, economic, social and infrastructural perspective.

KISSIMMEE RIVER: RESTORATION



RICH HEARNE: Veteran of Afghanistan and both Iraq wars, Rich now oversees the final leg of the Kissimmee River restoration, the largest restoration project in North American history. He looks forward to returning to the site to go fishing one day. Not a scientist, Hearne is a real everyman who people of all political stripes will respect, making his opinions on restoration more powerful.



KEN HUSER: Ken Huser has piloted riverboats on the Kissimmee for 20 years, and has witnessed the restoration first hand. He used to explore the old backwaters of dammed-off oxbows and described how putrid they had become; then his amazement at how they returned to life when water returned.



LAWRENCE GLENN: An enthusiastic scientist, Lawrence is in charge of monitoring the restoration and making sure it is a success. Lawrence gives us a clear explanation of how the Kissimmee project works: no seeds were planted, no banks sculpted, no species introduced. All they needed to do was get the water hydrology right and nature took care of the rest. It is compelling success story that points the way forward for Delta and Netley-Libau and the rest of the continent.

KISSIMMEE RIVER: RESTORATION



KISSIMMEE RESTORATION (IN PROGRESS): We were there to see the channel open up and the old river once again connected. This is restoration in action. Although it still looks like a construction site from the ground and the air, it sets up the remarkable transformation that will come.



In just one year, this arid and dry land will transform to lush green river, thanks only to flow of water. These visuals prove the power of water — when you get it right, the rest will follow and seemingly impossible transformations can take place overnight.



RESTORED KISSIMMEE: Seen from the ground and the air, this is what the photos above will look like in just one year's time. Our coverage includes a low pass of a Great Egret Colony, birds that have abandoned the river but now are returning by the thousands. From the air and from the water we see restoration in action.

THE GREAT EGRETS AND WOOD STORKS



DALE GAWLIK: Much like the canvasbacks brought us to the wetlands of the prairies, the great egret and wood stork bring us to the watershed in Florida. Biologist Dale Gawlik has studied them his entire life, and he reveals how they helped him unlock the secrets the Everglades. The story is a profound tale of the importance of understanding our watersheds.

Researchers wanted to restore bird populations, a task they thought would be simple: more water would lead to more fish, would lead to more birds.

It turns out the birds didn't need water. They needed a wet-dry cycle. Just like the discoveries in Delta Marsh, Everglades researchers discovered here the counter-balance of wet and dry were needed to make the ecosystem work. As the water draws down, the fish move into smaller and smaller pools. Eventually, thousands could be in one alligator hole just a few feet wide. And then, the birds feed, gathering the fuel they need not just to sustain themselves but to raise their young who hatch just as the dry season sets in.

Interrupt this wet-dry cycle and catastrophe results. Before this was understood, some birds would go a decade without successful nesting. Now that it is understood, birds are nesting productively every five years or less, and their numbers are once again growing.



EGRETS AND STORKS FEEDING: We see great egrets and wood storks feeding during the dry season, and in one case, do a delicate dance with a large alligator. The fish have congregated in his pool — the egrets need them. But the alligator wants the egret. The dry season has brought them all together and each must outsmart the other if they are to survive. The scene is a perfect visual metaphor for how the entire system works.



THE EVERGLADES



ARNOLD VAN DER VALK AND TREE ISLANDS:

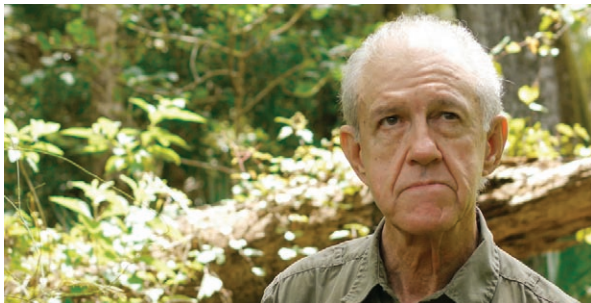
While in Florida, Arnold took us on a tour of the most important sites in the Everglades, with a particular focus on Tree Islands. Every wetland complex has a unique feature that makes it tick, and in the everglades, that feature is the tree islands. Starting as tiny elevations in the ecosystem, caused by something as simple as a few rocks, or as magical as an ancient Seminole Indian midden, these tree islands gradually grow year after year in a natural cycle that has only recently been understood. A bit of dry land gives a tree a place to grow. The roots hold the soil, while the branches attract birds. The birds eat, nest and leave their droppings on the island, which in turn nurtures more trees. The growing plants suck nitrogen from this nutrient intolerant system.

While many of these islands were lost because of poor water management, the innovative “LILA” tree island restoration project is proving they can be restored. Much like MERP, but set in the everglades, this project has dozens of cells where water levels and water flow is manipulated. It is a powerful demonstration of how variability of water is key to the survival of wetlands.

THE EVERGLADES



DAVID UNSELL AND THE STORMWATER TREATMENT AREAS: The Stormwater Treatment areas that ring the Everglades are largest man-made wetlands in the world and they protect one of the most the most fragile ecosystems. These huge wetlands eliminate up to 90 percent of nitrogen and phosphorous from surrounding high-impact sugar production before it enters the Everglades. They are a model for what could be done to stop the flow of nitrogen and phosphorus into large natural wetlands like Delta and Netley.



FRANKLIN ADAMS AND EVERGLADES CULTURE: Franklin Adams witnessed the two large hurricanes that brought the Everglades to the brink of destruction and as a result changed how water was managed in Florida. He has also witnessed the key parts that are preserved, including a big cypress swamp. Here, he regularly visits WWII era hunting camps established by returning veterans, still known to the gladesmen.



TOM SHIRLEY: Although in frail health, Tom Shirley is the quintessential gladesman, an early pioneer in the Everglades who spends months on end in the bush, working as a game warden. He can describe an era when birds still gathered in such numbers you thought they were smoke from a fire, and when the schools of fish in the water were so dense you could walk across them.



TAMIAMI TRAIL RESTORATION: Restoration need not be complex; it can be incredibly simple. In Florida, they are raising a highway — the first of 11 such elevated miles — that will allow the low, shallow sheet flow that sustains the key Everglades vegetation sawgrass to survive. It is a powerful and simple example of what it means “to get the water right” and how this can be accomplished without inconveniencing humans in the slightest.

WATERSHEDS: THE BIG PICTURE

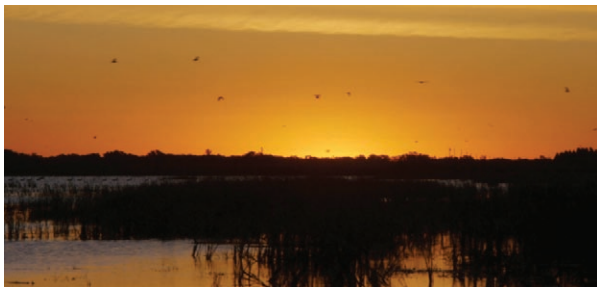
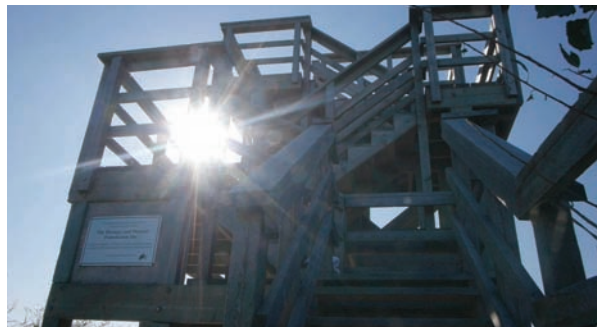


FRANK ROHWER: Frank Rohwer spoke about the ‘big picture’ of watersheds, particularly as habitat. He commented on how settlement impacted the way animals could use the landscape of North America and how our need to use natural resources inherently sets up conflicts with the natural world. But if society is willing to confront the tough choices we need to make, and to make trade-offs, we can find a way to live sustainably on our bountiful continent. These tough decisions are particularly pressing on the Gulf coast. As new state plans in Louisiana call for river diversions to be made in order to regenerate the coastal wetland, Frank sees these as the kind of bold moves that need to happen to save the valuable wintering grounds of Louisiana.



PAUL KEDDY: Esteemed wetland ecologist Paul Keddy described the fundamentals of watersheds and the natural principles behind them. He was able to articulate how flooding, water quality and habitat are all related and how what happens on the land matters to our water. We have made a lot of mistakes with the management of our watersheds; but the good news is we are, for the first time in human history, in possession of enough scientific knowledge to be able to correct some of these mistakes; and potentially live sustainably within our watersheds.

JENNIFER SHAY AND THE GREAT DELTA FLOODS: 1957 AND 2011



In the 1950s, a flood changed the course of waterfowl ecology. When its waters receded, the breeding grounds of Delta and Netley marshes were barren. One of the greatest waterfowl habitats on earth had been decimated.

To the scene came a young British graduate student name Jennifer Shay. Attracted from the other side of the ocean because of the legendary bird watching at Delta Marsh, Jennifer had no idea this place would become her home for three decades. Nor did she know the impact she was about to have on wetland and waterfowl ecology. While all of her colleagues were racing to find the ducks in the aftermath of the flood, Jennifer asked what would prove to be a far more important question: Who's studying the plants? The answer, it turned out, was no one.

Wading into the mud, Jennifer soon discovered something incredible — a glorious rebirth of the marsh underfoot. Seeds dormant for 50 years were sprouting, and before long, an abundant habitat for waterfowl had grown in. Shay's studies marked a symbolic turning point from simply trying to grow ducks to focus on conservation of duck habitat so that their populations could sustain themselves. Her research on the wet-dry cycle that sustains wetlands would also help spur on larger groundbreaking work of the Marsh Ecology Research Program (MERP), which confirmed the importance of wet-dry cycles in wetlands and provided the scientific foundation for conservation efforts to come.

In the aftermath of the great Manitoba flood of 2011, Jennifer returned from overseas to visit her beloved marsh. She reflected on what was truly needed. It was not a flood, but a dry spell — one that has been absent from the marsh for nearly 50 years. The man-made interruption of the wet-dry cycle she first helped scientists and others to understand is the key to restoring what was once the most important waterfowl grounds on the planet.