Spring

2014

BAD RIVER NATURAL RESOURCE

Common Ground

Spring Fisheries Projects

By Christopher Dean, Fisheries Specialist

Fisheries crew spawning walleye on the Kakagon River. Photo by Lacey Hill, Wildlife Specialist

A busy spring is just wrapping up for Bad River's fisheries staff. This spring, the fisheries crew conducted its annual walleye broodstock survey on the Kakagon River, operated the Bad River Fish Hatchery, and monitored the tribal walleye harvest in the Kakagon River. The walleye broodstock survey did not begin until May 2nd this year due to the cold snowy spring. In their sixteen nets lifts, the fisheries crew caught a total of 1,479 walleye (960 males and 519 females). After completing the survey and collecting eggs for the hatchery, the fisheries crew released 1,272 walleye back into the Kakagon River, and donated 207 walleye to the elderly.

This year's walleye and yellow perch egg collection was also delayed this year due to the weather, but the Hatchery Crew was still able to collect 26 million walleye and 900,000 thousand yellow perch eggs. During 2014, 40% of the 26 million walleye eggs incubated in the Bad River Fish Hatchery successfully hatched. The walleye rearing ponds, Kakagon River, and Bad River were stocked with 0.9, 8.6, and 0.9 million two day old walleye fry respectively. Walleye will be reared in the rearing ponds for 45 to 50 days before they are stocked into

(Continued on page 2)

Inside this issue:

Special points of interest:

- *Eating the Soil– For Bad River Ojibwe (Poem by Mary Linton)*
- *Save The Date- Bad River Lake Superior Day*
- *Piping Plover Word Search*
- *New Piping Plover Monitors*

Spring Fisheries Projects

By Christopher Dean, Fisheries Specialist

(Continued from page 1)

Reservation waters. This year, 900,000 thousand yellow perch eggs were also collected and incubated in the Bad River Fish Hatchery. The perch eggs had a higher hatch rate than the walleye eggs, with approximately 756,000 of the perch eggs hatching. All of the perch fry were stocked into a rearing pond and will be stocked into Reservation waters throughout the summer.

The total allowable catch for walleye in the Kakagon River for 2014 was set at 1,400 fish with a trigger of 500 female walleye to close the fishery. During this year's season, the Tribe's Creel Clerks reported that Tribal members harvested 555 Kakagon River walleye with gill netters harvested 331 walleye; dip netters harvested 222 walleye, with 75 fish being caught off of the Goslin Bridge and 147 fish being caught off of the Kakagon Bridge; tribal elders were given 207 walleye. A total of 46 adult walleye died in the hatchery this year from May 6th to the 17th. Forty of the hatchery mortalities were donated to the elders and the remaining 6 walleye were spoiled and could not be donated.

If you have any questions regarding this year's spring walleye projects or if you would like more information, contact Christopher Dean, Tribal Fisheries Specialist at 715-682-7123 ext. 1552.

Fisheries crew checking a fyke net set on the Kakagon River. Photo by Ed Leoso, Fisheries Technician.

Walleye eggs incubating in the Bad River Fish Hatchery. Photo by Ed Leoso, Fisheries Technician.

"Mashkawizi"

By Lacey Hill-Kastern, Wildlife Specialist

On March 19th, 2014, an adult male bald eagle was found injured off of Dock Road. It appeared to be hit by a car. It was captured and brought to BRNRD, from there the eagle was transported to the Spooner Vet Clinic, where a veterinarian specializes in raptor rehabilitation. Once there the eagle was diagnosed as being extremely malnourished. The eagles wing was x-rayed and it was determined by the amount of healing that had occurred that the eagle had been on the ground with that wing injury for around two weeks before he was found!

The eagle also had a silver leg band on it. From that leg band BRNRD was able to see where he had came from and how old he was. He was banded in Cornucopia in 1996 as a chick. That makes him eighteen years old. He is very strong.

Due to the extent of his healing that had already occurred, the vet decided not to operate but to rather nourish him and allow his wing to heal naturally. This process takes more time but seeing at it was already starting to heal, it seemed like the better option. Once Mashkawizi regained his strength he was moved to a larger facility so he could work on his flying. He is currently located at Wild Instincts Wildlife Rehabilitation Center in Rhinelander, WI and they are hopeful he will fly again. He has made a lot progress since the beginning of his stay. To learn more about the rehab facility check out their website at http://www.wildinstinctsrehab.com.

The Piping Plover

By Lacey Hill-Kastern, Wildlife Specialist

It's that time of year again… the piping plovers are back! Some of you might be asking, "What is a piping plover?" Well, the piping plover is a shorebird. The great lakes population of piping plovers is federally endangered and protected by the United States Fish & Wildlife Service through the Endangered Species Act. Long Island/Chequamegon Point has been, for many years, the only location on Lake Superior shoreline in Wisconsin where the piping plover successfully nests. That is why every year we hire two piping plover monitors to spend their summer on Long Island/Chequamegon Point to monitor and protect the existing nesting population and educate and visitors to the area about piping plovers and what they can do to help.

I suppose it would help if I gave you a better description of what they look like. They can be hard to spot. They are small, about the size of a robin, and are sand colored with a white under side and a black band around its neck and running between its eyes. They have orange legs and an orange beak with a black tip.

It is very important to be careful during the months of May-July because of shoreline nesting birds. Their nest are hard to see and can be easily stepped on. Piping plovers create a small depression in the sand known as a scrape and will lay up to four sand colored eggs. Since there is a lot of visitation and a potential for nest predators on Long Island throughout the summer we place exclosures around all the nests we find. An exclosure kind of looks like a cage that gets staked over the nest but it allows only small critters to pass through it. The adult plovers can go in and out as they please but larger nest predators are unable to get to the nest or the plovers. Then around that we put up a psychological fence, which is essentially twine connecting signs that explain there is a plover nest and to not disturb the birds.

Currently on Long Island, we have four nesting pairs, all with four eggs. Typically on Long Island the eggs hatch around the first to second week of July. Once the chicks hatch they grow fast and typically leave for the Gulf Coast around mid August. Soon after the chicks hatch they can run around all over the place and will follow their parents to forage on the beach.

If you spot a piping plover make sure to document the location, take a picture if possible, and let BRNRD know as soon as possible.

Piping Plover Monitor, Andrew, places an enclosure around a nest located on Long Island.

Piping Plover Word Search

I	U	R	G	D	B	G	I	I	D	E	H	B	K	J
C	E	L	U	R	N	C	S	O	N	Z	U	I	C	Z
Y	H	N	F	I	T	N	L	D	A	P	Z	N	V	A
H	P	E	P	F	E	Z	A	E	S	P	M	E	T	U
Z	C	I	Q	S	O	N	N	W	F	S	J	S	E	S
Z	P	A	T	U	G	R	D	Q	E	I	G	H	N	T
Y	D	S	E	E	A	G	A	I	B	H	P	I	A	C
G	B	E	R	B	N	M	K	G	O	A	S	I	V	E
I	W	E	T	O	Y	V	E	H	E	L	G	N	D	S
B	D	K	L	C	X	V	E	G	Q	O	E	H	R	N
D	O	O	R	B	E	R	U	S	O	L	C	X	E	I
T	Q	S	S	T	N	T	Q	R	A	N	K	E	M	L
Y	S	A	X	Q	O	X	O	B	X	O	O	G	F	N
M	O	I	Z	Q	O	E	M	R	L	R	N	R	O	K
P	L	O	V	E	R	E	C	H	P	M	M	W	B	E

BEACH	BINESHIINH	BROOD
CHEQUAMEGON	ENDANGERED	EXCLOSURE
FORAGE	INSECTS	ISLAND
LONG	NESTS	PIPING
PLOVER	PROTECTED	SAND

The Importance of Protecting Water Resources

By Jessica Strand, Wetlands Specialist

Constructing roads and building in wetlands can result in water problems for the structures if the development isn't designed properly, but it can also impact the surrounding water resources and cause changes to the ecosystem. This driveway is backing up the flow of water across the landscape because it wasn't designed to minimize impacts to the surrounding wetlands.

Oftentimes the common everyday wetland is overlooked for its grander cousin, the Kakagon and Bad River Sloughs. However, the wetlands we see every day here on the Reservation are just as an important part of the landscape as the Sloughs—even the ones in your backyard.

There are a variety of functions that your backyard wetland might have that help support the other water resources within the Bad River Watershed. Your wetland might help capture and retain melt water and rainfall, slowly letting it absorb into the soils and replenish the local aquifers that provide drinking water or bubble out in other places on the landscape as springs and seeps. Or, your wetland might be the headwater to an creek or stream, collecting rainfall and slowly releasing it to the watercourse to provide even, consistent water levels year round. Or, your wetland could host wildlife species, filter pollutants, and/or harbor threatened or endangered species, plus have many other possible functions.

If your backyard wetland was the headwater to a creek or stream, what do you think might happen if you were to fill it in? There are several possibilities. One possibility is that the water that originally would collect in the wetland, with no basin in which to collect, run along the surface of the earth to a new area. This area could be your neighbor's yard, a nearby stream, or other such place. If the water ran along the ground to a nearby stream, it might bring with it natural and manmade debris that normally would have been carried to your wetland to be filtered out before the water flowed into the stream. So, the stream could end up with higher levels of nutrients, organic particles, sediment, and other pollutants than it would have had originally. These pollutants could then travel downstream and affect other resources, like the sturgeon spawning beds or the wild rice stands.

Since making one small change to the landscape by filling in a wetland can cause impacts that are not always easy to discern, it is important that regulations that help protect our water resources on the Reservation are followed—whether federal or Tribal. One such regulation is the Bad River Reservation Wetland and Watercourse Protection Ordinance (WWPO) that was adopted by the Tribe in 2009. The WWPO regulates impacts to the water resources on the Reservation by requiring everyone (landowners, utility companies, tribal members and nonmembers, etc.) wishing to impact a water resource (wetland, stream, lake, pond, etc.) to adhere to certain conditions to minimize the impact, and in many cases, receive a permit from the BRNRD prior to carrying out the impact-causing activity.

The best way to know whether an activity that you are planning is regulated or not is to contact Water Resource staff at the BRNRD. Staff here can help determine whether your project is impact a water resource, if the impact requires a permit under the WWPO, whether there might be other permits needed for the project, and how best to design a project to meet the requirements of the WWPO. If you contact us we can help you remain compliant with Tribal and federal regulations so that you don't have to worry about possible repercussion for not following regulations. Also, we can help you with design and implementation; possibly providing suggestions to meet your needs with little impact to the water.

(Continued on page 5)

Maps on the Mind: The Low-down on LiDAR

By Kim (Ness) Sundeen, Geographic Information System (GIS) Specialist

The Importance of Protecting Water Resources *Continued*

By Jessica Strand, Wetlands Specialist

(Continued from page 4)

Minimizing any impact to the water resources in your backyard wetlands and other water resources means that you are protecting other water resources, such as the Kakagon and Bad River Sloughs. Help us keep this land as healthy as possible for the next seven generations—talk to the Water Resources Program before you start a project and come to us with your concerns about what you may be seeing out on the landscape.

Thank you.

The Water Resources Program can be contacted by calling 715-682-7123 and asking either for Jessica Strand (extension 1562) or Naomi Tillison (extension 1566).

The installation of erosion and sedimentation controls might be a condition attached to a Tribal permit authorizing activities impacting water resources. At this culvert replacement , silt fence and erosion matting helps to minimize the impacts to the wetlands nearby which discharge water into Denomie Creek.

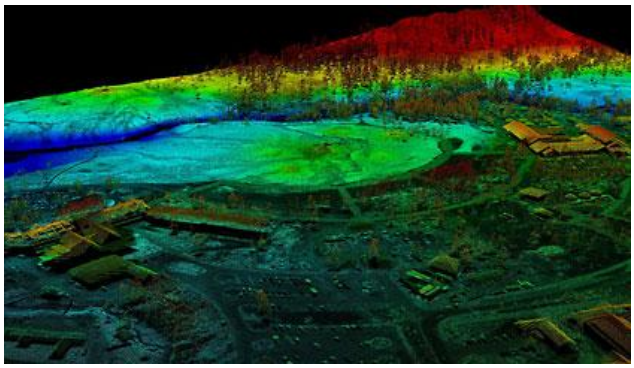

***Figure 1**. LiDAR point cloud of Old Faithful (seen in middle) in Yellowstone National Park with 8.3 million point returns displayed in this image. Photo Credit: Christopher Crosby, San Diego Supercomputer Center, UC San Diego, http://www.sdsc.edu/News%20Items/PR121109_opentopo.html*

What is LiDAR?

LiDAR, the acronym for Light Detection and Ranging, is an active remote sensing technology (similar to RADAR) used for producing digital terrain models, elevation models, and high resolution contour maps of an area. An airborne laser profiling system (on an airplane or helicopter) sends out thousands of pulses of intense light directed at a certain surface such as a house, the ground, or a tree. The pulses bounce off the object and return to the sensor, which, based on the time and distance the light traveled, gives an extremely precise elevation (height) to that object. The data shows a dense surface of points (a "point cloud", Figure 1) of elevation, latitude, and longitude on the earth's 3D surface (1). With this information, you can create 3D landscapes to measure elevation, locate roads, telephone poles, or culverts, measure tree heights, identify hidden trails beneath a dense tree canopy, measure stream slope and edges of streams, among many other applications.

(Continued on page 6)

Maps on the Mind: The Low-down on LiDAR *Continued*

By Kim (Ness) Sundeen, Geographic Information System (GIS) Specialist

(Continued from page 5)

LiDAR Collection

Airborne LiDAR data is collected with a laser profiling system mounted to the bottom of airplane or helicopter (similar to how digital cameras are mounted to collect aerial imagery) (Figure 2). Each LiDAR profiling system includes a "laser source and detector; a scanning mechanism and controller, airborne GPS and [Inertial Measurement Unit] (IMU) equipment; a high-accuracy, high resolution clock for timing laser emissions, reflection, GPS/IMU, and scan-angle measurements; high performance computers; and high capacity data recorders" (3). High-accuracy and precise 3D locations are collected from each laser pulse emitted (Figure 3). That same pulse is precisely timed upon reflection or "return" to the LiDAR profiling system. "Using the constant speed of light, the time difference between the emission and reflection of that pulse, a slant range distance (i.e., line-of-sight distance) is calculated" (3) to produce extremely accurate and precise longitude (x), latitude (y), and elevation (z) 3D positions.

Figure 2. Airborne LiDAR profiling system mounted on a helicopter. Photo Credit: Avcon Industries, Inc. wwww.justhelicopters.com.

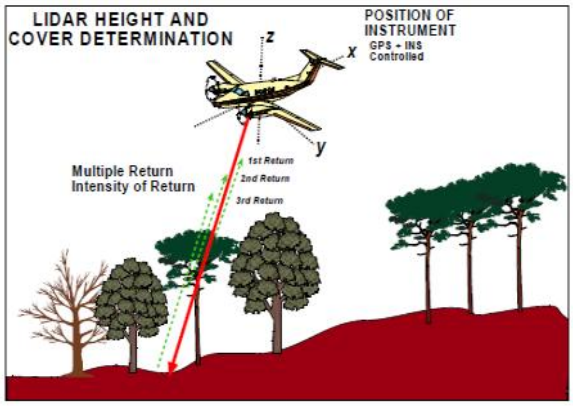

Figure 3. How an airborne LiDAR system collets 3D point information during a flight. Emitted laser electron (light) pulses are reflected off terrain and reflected back to the LiDAR system as "multiple returns" (3). Multiple

LiDAR Processing

Following LiDAR collection, the "raw" terabytes of 3D data are processed by high-powered computer systems back in the office. The resulting products are detailed 3D "bare earth digital terrain models" (DTM) of the terrain with all vegetation, trees, and other manmade objects removed. A "digital elevation model" (DEM) is also produced showing the elevation with all vegetation, trees, and manmade objects (such as buildings, roads, or power lines) included. Other LiDAR-derived products include hydro-breaklines, point clouds of all laser pulse returns, contour maps, and feature extraction for buildings, roads, utility lines, fire hydrants, culverts, among other manmade objects.

LiDAR Applications

Depending on how one plans to use a LiDAR product, each LiDAR application requires different collection and accuracy standards. For instance, to create a general base-map with terrain, buildings, lakes, and streams identified, LiDAR data should be collected with laser pulses emitted and reflected up to every 5 meters producing a 5-foot elevation contour map. On the other hand, for high-detailed mapping needs such as those used in mapping transportation networks and utility lines, laser pulses should be emitted and reflected every 1-2 meters, which produces 1- to 2-foot elevation contour intervals. (3)

(Continued on page 7)

Maps on the Mind: The Low-down on LiDAR *Continued*

By Kim (Ness) Sundeen, GIS Specialist

(Continued from page 6)

Base-mapping (Figure 4):
Processed LiDAR data produce terrain landscape maps, high-detailed stream and lake outlines, and precise slope along contours in elevation data. The cost of and amount of LiDAR data for base-mapping are on the lower end. LiDAR laser pulses should be emitted and reflected up to every 5 meters (e.g., 5-meter point spacing), which produces -foot elevation contour intervals (3). Figure 4 shows ancient Mayan ruins identified using a 1-foot contour map; in this case, the base-mapping accuracy requirements were at 1-meter point spacing.

Floodplain Mapping (Figure 5):
LiDAR processing provides accurate "hydro-breaklines" or edges of streams and lakes where the slope becomes zero or near zero at water's edge. Using these breaklines allows staff to update existing stream, lake, wetland layers. Advanced analysis can produce floodplain maps and streamflow dynamics to reveal flood-prone areas. For this type of high-accuracy and precision mapping, the cost of and amount of LiDAR data are on an intermediate level; LiDAR collected are more accurate than general base-mapping, less accurate than transportation mapping, but the same accuracy levels used for biomass estimation. For floodplain mapping, LiDAR laser pulses should be emitted and reflected up to every 3 meters, producing up to 3-foot elevation contour intervals (3).

Biomass Estimation (Figure 6):
LiDAR data collected during full leaf-on time periods (when leaves are out) produce multiple returns of laser pulses from the ground, understory, and tree canopy (Figure 3). Displaying and converting the "point cloud" to density and intensity allows measurement of parameters associated with aboveground organic woody biomass. Such advanced analysis generates estimates of acreage and volume of organic matter in woody material, which informs timber harvest plans (4). The cost of and amount of LiDAR data are about the same as for floodplain mapping. LiDAR laser pulses should be emitted and reflected up to every 3 meters for 3-foot elevation contour intervals (3).

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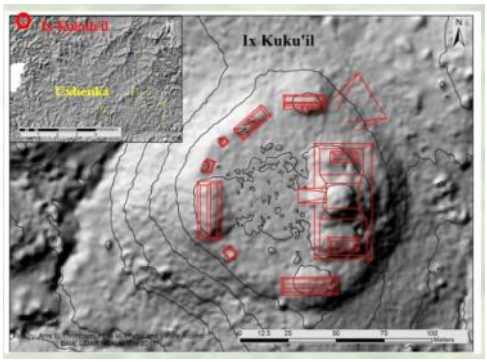


Figure 4. Example of LiDAR-derived contour lines of ancient ruins identified as the Mayan Kukuh'il's main plaza from a 2012 University of New Mexico research project (5).

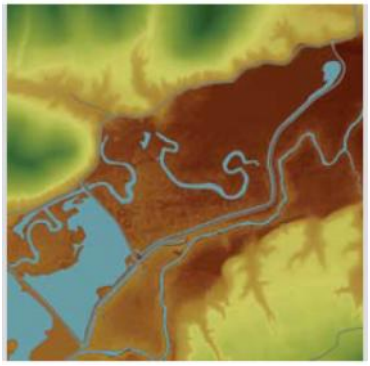


Figure 5. LiDAR-derived floodplain map, with colors depicting changes in elevation. Blue represents flowing water. (2)

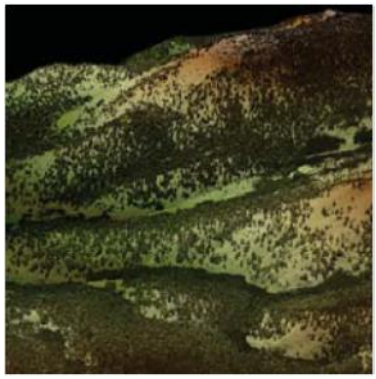


Figure 6. Example 3D landscape depiction created from a LiDAR-derived terrain model with orthophotography (aerial imagery) draped over the terrain (2).

Maps on the Mind: The Low-down on LiDAR *Continued*

By Kim (Ness) Sundeen, Geographic Information System (GIS) Specialist

(Continued from page 7)

Transportation and Corridor Mapping (Figure 7): Transportation planners or emergency managers can supplement existing roads, utilities, and infrastructure maps with the detailed elevation and outlines of structures or utilities. Utility lines, culvert outlines, slopes of highways and other connecting roads, as well as precise outlines of buildings, structures, or even mailboxes are viewable. For this type of high-accuracy and precision mapping, both the cost of LiDAR data and amount of data collected increases significantly. To collect data for transportation and utility lines, LiDAR laser pulses should be emitted and reflected up to every 2 meters, which produces up to 2-foot elevation contour intervals (3).

Costs of LiDAR

Each LiDAR project is priced differently depending on the total project area, project shape (rectangular is cheaper), project terrain (flatter is cheaper), accuracy requirements (lower accuracy or lower point spacing is cheaper), and products requested (3). With any LiDAR project, requesting more LiDAR-derived products increases the total project cost. As such, prior to contracting with any company to collect LiDAR data, one should know ahead of time what products he or she intends to use.

In general, the larger the area, the lower the price per square mile of collecting LiDAR data becomes. A project area under 20 square miles may cost $750-1,000 per square mile, while larger areas over 100 square miles, bring a price tag of $200-500 per square mile (1). Elizabeth Cook, LiDAR specialist with the USGS-NRCS, suggests that for small projects (less than 10 square miles), contracting with traditional surveying and photogrammetry firms is more economical (1). Beyond 10 square miles, LiDAR collection becomes more cost-effective. Assuming a flat to moderate terrain, for 3-meter point spacing (produces 3-foot contours), a 500 square mile project area may cost $200-300 per square mile; for 1-meter point spacing (produces 1-foot contours), a 100-500 square mile project area may cost $350-450 per square mile (3).

Comparing another Tribe's LiDAR Project

Kristine O'Neal, GIS Specialist with the Table Mountain Rancheria, Tribal Transportation Program, in Friant, CA, worked with two LiDAR consulting groups to acquire LiDAR for the 20 square mile reservation for tribal transportation planning. She sent out a Request for Proposal (RFP) specifying the equipment and cost ranges for obtaining 2-foot contours of

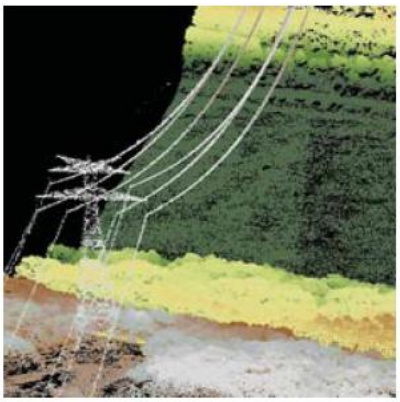


Figure 7. Example utility data extraction from LiDAR with height shown in different colors (2).

LiDAR data and high-resolution 3-inch orthophotography. Orthophotos, also called orthoimagery, are a type of aerial imagery that have been "orthorectified" (i.e., geometrically corrected using surveyed ground control points to remove distortions in the photograph after taken during an aerial flight). The Watershed Sciences, Inc (based out of Oregon) and Photo Sciences (based out of California) responded to the RFP. Both companies provided quotes of obtaining LiDAR and 3-inch orthophotos at the cost of $1,900 and $2,700 per square mile. The first price was much less because Watershed Sciences, Inc., had already scheduled another LiDAR collection in a nearby area; the Tribe could therefore share the cost of mobilizing the collection platform.

What Does This Mean for the Bad River Tribe?

For the Bad River Tribe, the cost of acquiring LiDAR data will cost less than the Table Mountain Rancheria Tribe's $1,900-2,700 per square mile cost. That tribe only collected LiDAR for a 20 square mile area, which resulted in a higher cost per square mile than what the Bad River Tribe would pay for its larger land-base. As a thought experiment, consider a rectangular project area around the Bad River Reservation with over 124,000 acres or 194 square miles on relatively smooth terrain. The total cost of collecting LiDAR for base mapping (5-meter point spacing to produce 5-foot contours) and for transportation/utility mapping (1-meter point spacing to produce 1-foot contours) could cost

(Continued on page 9)

Maps on the Mind: The Low-down on LiDAR *Continued*

By Kim (Ness) Sundeen, Geographic Information System (GIS) Specialist

(Continued from page 8)

$67,900-$97,000 in total. In another case, for the hilly 130 square mile area around the Penokee Range, the cost of LiDAR might increase slightly ($500-$700 per square mile or $65,000-$91,000 in total), but still be substantially less than what the Table Mountain Rancheria Tribe paid (1).

Just this past spring in 2014, the Wisconsin Regional Orthophotography Consortium (WROC) approached Kim Sundeen, GIS Specialist with the Bad River Tribe, with a proposal to partner on the WROC 2015 Program to collect both high resolution 6-inch orthophotos and LiDAR in the northern Wisconsin counties. The "WROC 2015" Program is working with private companies, tribal, county, and state governments, and federal agencies to plan the data collection for early spring of 2015. By sharing the set-up costs of the data collection, as the Tribe in Friant, CA did, the overall cost of LiDAR and orthophotos drops substantially.

The stakes are high if the Bad River Tribe chooses not to participate in the WROC 2015 program because the data may not be publically-available after data are collected. Thus, the Tribe would need to purchase data after the fact at a higher cost. By partnering and contributing funds to the data collection, the Bad River Tribe will not only have access to data within the Bad River Reservation, but will have access to LiDAR and 6-inch orthophotos throughout the entire Bad River Watershed in Bayfield, Ashland, and Iron Counties!

What Can You Do?

Learn more about LiDAR applications in for civil, cultural, and natural resources management. The WROC 2015 Program is hosting an online webinar this coming June 19th, 2014. Kim Sundeen will record a video of the webinar to allow tribal staff and tribal members to view the meeting at their convenience. Kim will then have concrete answers about partnerships, funding contributions, and data accessibility for the Bad River Tribe. Beyond reading more about LiDAR, feel free to contact Kim Sundeen with questions, tutorials, or other resources on understanding LiDAR information for tribal management.

References

(1) Cook, Elizabeth. *Does LiDAR Satisfy Your Data Requirements and Budget Constraints?* Missouri: Missouri Geographic Information Systems Advisory Committee; U.S. Dept. of the Interior, Natural Resources Conservation Service, 2011. PDF file.

(2) *LiDAR Light Detection and Ranging Geospatial Solutions.* Sheboygan, Wisconsin: AeroMetric, Inc, 2013, PDF file.

(3) *LiDAR Mapping Fact Sheet.* Maryland: Fuguro Earthdata, Inc., 2011. PDF file.

(4) Lu, Dengsheng, Qi Chen, GuangxingWang, EmilioMoran, Mateus Batistella, Maozhen Zhang, Gaia Vaglio Laurin, and David Saah. (2012). "Aboveground Forest Biomass Estimation with Landsat and LiDAR Data and Uncertainty Analysis of the Estimates." *International Journal of Forestry Research* 2012 (2012): 16 pgs. PDF file.

(5) Thompson, Amy E. and Keith M. Prufer. "Detection and Evaluation: The Use of LiDAR in Archaeological Conexts at Uxbenka, Belize." Poster. University of New Mexico, 2012. PDF file.

Introduction to Radon

By Daniel Wiggins, Air Quality Technician

Radon is related to over 20,000 radon-induced lung cancer deaths each year and is the second leading cause of lung cancer after smoking. Radon is formed when uranium, thorium, and radium naturally breakdown within bedrock and release radon gas into the soils, rock and water. It is ever-present and found in outdoor air and indoor air of every type of structure and seeps through entry-ways that include cracks and holes in basements, open crawlspaces, and openings in the foundations.

Once in the home radon continues to breakdown into radioactive particles that can be breathed in and enter the lungs airways. The particles continue to release energy that can then contribute to the development of lung cancer. The concentration and length of exposure are both factors in the risk towards development of radon-induced lung cancer, which onset of the disease may not be noticed for many years.

In rare cases radon is found in water and through aeration can cause indoor radon levels to rise and pose a risk. Although radon in the air poses a greater risk, radon in water does present a risk of developing cancer within the internal organs, primarily stomach cancer.

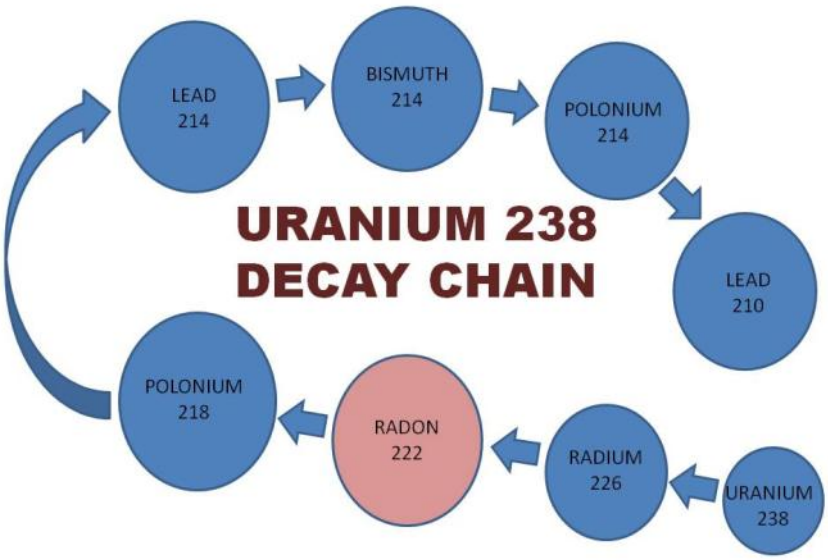
Even though there is still no safe exposure level of radon, a person's risk can be lowered by reducing the radon levels in the home with proper radon reduction methods. The average indoor radon level is estimated at 1.3 pCi/L and outdoor at 0.4 pCi/L.

The EPA sets their action level of indoor radon levels at 4.0 pCi/L, and recommends to homeowners that they fix their homes if levels are still found at 2 pCi/L and above.

The fortunate thing is homeowners can fix their homes with effective and efficient radon reduction methods. Still not many homeowners are prepared for the affects of radon, yet the rehabilitation to a home to lower it. There have been many radon reduction (mitigation) techniques attempted over the past decades, and are still several being used. The EPA realizes the complexity of radon reduction and has published the *Consumer's Guide to Radon Reduction* (www.epa.gov/radon/pdfs/consguid.pdf), which will help homeowners in locating the right contractor, understanding the right radon reduction method, and maintaining those systems after installation.

The Bad River Tribe is fortunate to have a Radon Program that offers free measurement testing and radon services to Tribal Members. If you have any questions concerning radon, please contact Daniel Wiggins, Air Quality Technician, at 715-682-7123, extension 1553 or email at Air1@badriver-nsn.gov.

This and more information on radon can be found at the EPA's website at www.epa.gov/radon/.



Left is the Uranium Decay Chain. Radon gas is associated with both the uranium and thorium decay chain.

Above are test kits and monitoring devices that are used by the BRNRD. Testing is the only way to know if your home has elevated levels of radon.

Presidential Directives: Protect Air Quality

By Nathan Kilger, Air Quality Specialist

In the continued effort to protect the environment, natural resource base, and the functions of the natural systems on which all life depends, the Bad River Band of Lake Superior Chippewa is proposing to prevent significant deterioration to air quality by redesignating the current air quality classification.

Air quality standards were set in the Clean Air Act of 1970 across the United States in response to rapidly deteriorating environmental quality. In his remarks while signing the Clean Air Act, President Nixon stated, "that 1970 will be known as the year of the beginning, in which we really began to move on problems of clean air and clean water and open spaces for the future generations of Americans."

While signing the Clean Air Act in 1970, President Nixon invoked President Theodore Roosevelt's dedication to environmental conservation as a "…a goal that Theodore Roosevelt deeply believed in and a goal that he lived his whole life by. He loved the environment. He loved the clean air and open spaces…"

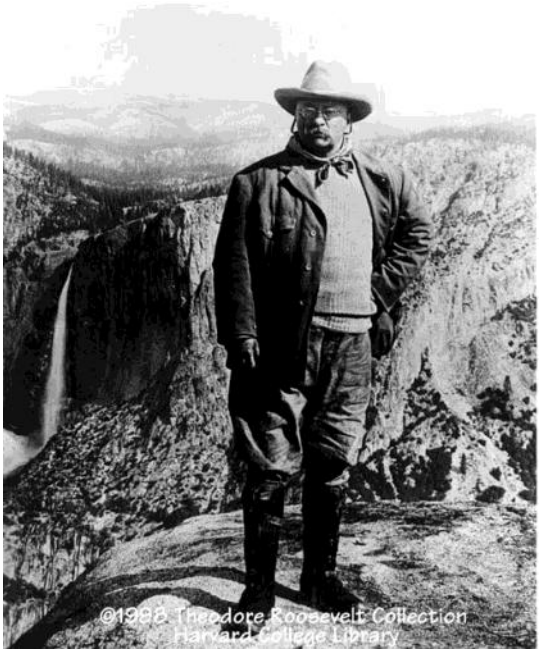
Additions to the Clean Air Act in 1977 added further protections for "achieving and preserving healthy air in our Nation," as stated by President Nixon while signing the amendment.

Since 1970 and 1977, the Clean Air Act was amended in 1990 by President George Bush, who stated that this update was designed to reduce impacts to human health, as well as reducing damage to "lakes, streams, parks, crops, and forests," while increasing energy security "as utilities and automobiles switch to cleaner burning alternative fuels."

While National Ambient Air Quality Standards protect air quality across the country and have resulted in positive air quality trends since 1970, the Clean Air Act allows States and Tribes to further protect air quality.

The Bad River Band is moving forward with the redesignation process, continuing 111 years of preserving, protecting, and preventing significant deterioration of air quality that will be remembered and enshrined for the next seven generations. Consultation with state and local governments is currently being conducted, as well as notifications being sent to federal natural resource management agencies and other Tribes. Future steps include releasing a technical report, an open comment period, and then a public hearing. These future steps will be advertised in the local newspaper, this newsletter, and posted on the calendar on the Bad River website.

Redesignating the air quality of the Bad River Reservation under the Clean Air Act will maintain current air quality while encouraging future industrial growth to take reasonable measures to restrict increased air pollution. President Nixon described this as "economic growth in an environmentally sound manner".



Climate Change Will Impact Bad River Eco-Economies

By Gregory Hitch and Nicholas Hunter, UW-Madison Students

For our Environmental Studies Capstone Course at the University of Wisconsin-Madison, we traveled to the Bad River Ojibwe reservation and met with tribal elders Hilary Butler and John Denomie to better understand the human and cultural impacts of climate change in Bad River. For thousands of years indigenous people in Wisconsin have hunted, fished, and gathered for subsistence and trade. These activities are central to the identity of Wisconsin tribes, including the Bad River Ojibwe. However, climate change is impacting the ecological integrity of the Ojibwe homelands. As a result, *Manoomin*, or wild rice, and cold-water fish may not survive in their current habitat. Overwhelming scientific and observable evidence indicates that human-induced climate change is upon us and is tearing the cultural and ecological fabric that knits the Bad River community together. Although Bad River is a leader in water stewardship and eco-economies such as wild rice harvesting, climate change-induced ecological changes will continue to present challenges to these iconic practices.

Ojibwe origin stories tell of the "long walk" in which they migrated from the eastern coast of North America back to their homeland in the Great Lakes area to find the "Food that Grows on the Water," or *Manoomin*. Transcending simple subsistence, fishing and gathering are both spiritual and economic practices that bring the Bad River community together around traditional stories and vital ecological knowledge. Denomie shared the significant cultural role of ricing: "The most important part of ricing is that it feeds the people that live on this earth, whether it's here or any other place. You teach your children, you're teaching a generation how to provide for themselves, then when you leave this earth, you know that they're well taken care of because you have taught them that. You can live forever in their minds. That's why ricing is important to me."

John Denomie teaching the techniques of harvesting wild rice during the Monomin "Wild Rice" Workshop. Photo courtesy of BRNRD.

Tribal elder Hilary Butler. Photo courtesy of the BRNRD.

However, according to the Lake Superior Climate Change Impacts and Adaptation Report, more intense rainfall events will trigger increased runoff pollution making water less suitable for fish and *Manoomin* habitat by increasing the level of turbidity, facilitating the introduction of invasive species, and increasing siltation. The Kakagon-Bad River Sloughs were designated a Ramsar Wetland of International Importance. Extreme changes in water levels due to drought and flooding have already occurred on the reservation and are projected to intensify. Butler discussed the first time the Kakagon-Bad River sloughs were closed: "In 2012 we had big storms that uprooted the plants before they had established themselves… There just wasn't any rice out there for people to harvest… I'm sure that had to do with climate change." Traditional Ecological Knowledge (TEK) from elders such as Butler and Denomie with first-hand experience spanning decades is crucial to understanding the profound changes occurring. The tribe uses a combination of TEK and Western science to monitor the health of Kakogon-Bad River ecosystems. TEK is especially important in guiding restoration projects after severe storms or droughts change the ecosystems where *Manoomin* now thrives.

Manoomin's ability to grow in the coastal sloughs of *Gitchi Gami*, or Lake Superior, is also threatened by drought: "The first year they closed [Kakagon Slough], the water levels were way down," Hilary recalled "…you could walk on the muck, where usually there was open water, where you had had three feet of water." Furthermore, warmer water temperatures of

(Continued on page 13)

Climate Change Will Impact Bad River Eco-Economies *Continued*

By Gregory Hitch and Nicholas Hunter, UW-Madison Students

"The most important part of ricing is that it feeds the people that live on this earth, whether it's here or any other place. You teach your children, you're teaching a generation how to provide for themselves, then when you leave this earth, you know that they're well taken care of because you have taught them that. You can live forever in their minds."
-John Denomie, Bad River Tribal Elder

(Continued from page 12)

inland lakes will affect the ability of *Manoomin* to survive. Warmer water in *Gitchi Gami* will push cold-water fish such as salmon and trout deeper, making them harder to catch. Finally, the subsistence and cultural resources the Ojibwe traditionally rely on are simply no longer dependable, as Denomie shared, "One year it might be excellent, plenty of rice for everybody. The following year it could be a bad season because of water fluctuations, climate, temperature, especially in Northern Wisconsin."

Climate change presents an unprecedented challenge but also a unique opportunity. The Bad River community has exemplified sustainability practices, resisting industrialization to preserve land, water, and wildlife habitat. Although the ecosystems supporting the community are threatened, the Ojibwe are remarkably resilient. The Bad River community can do its part to fight climate change by continuing its vital work on water stewardship and promoting eco-economies. Just as a movement has grown around opposition to the proposed taconite mine in the Penokee hills, the Bad River community can spearhead a movement to promote climate change adaptation, demand emissions reductions, and encourage a sustainable land ethic.

Eating the Soil
For Bad River Ojibwe

Poem by Mary Linton

Home is not different from the body
—the heart, the stomach.

I knew a man who always rose early,
walked his farm lanes to a river,
then back to his house for a light
breakfast, having already filled up
on reflections of silver
maples on moving water.

Home is no different from working
a canoe to where Bad River opens
at the great lake, where
it slows, feeds the rice,
lures sturgeon to fan
cold, rich waters

that grow people
who every day
have their land
on their tongues.

New Piping Plover Monitors

Sarah Lehner, Piping Plover Monitor

My name is Sarah Lehner, I am one of the Piping Plover monitors for 2014. This spring I graduated from UW-Stevens Point with a B.S. in Wildlife Ecology and was fortunate enough to find a great job in my field, working with an endangered species, the Piping Plover. I am extremely excited to work with the Bad River Band to help these charismatic little birds raise their numbers. This summer my co-monitor and I will be keeping tabs on nesting Plovers on Long Island, in hopes of increasing the number of chicks that make it to adulthood. Great Lakes Piping Plovers make up the smallest of three populations in the world, as of now the Great Lakes region hosts around 60 pairs. By finding nests, setting up predator exclosures around the nests, banding chicks, recording data, and educating the public we expect to improve the odds for these birds to survive and thrive. I look forward to working with the Bad River Department of Natural Resources, and a great field season on the Island!

Andrew Harry, Piping Plover Monitor

Boozhoo! Can everyone let out a peep for the piping plover? Good, good. Now I don't feel so bad; it took me two days to start talking to the plovers, it only took you two seconds. My name is Andrew Harry, and I will be working on the piping plover project on Long Island this summer. I just graduated from the University of Wisconsin-Madison with a bachelor's degree in English and Environmental Studies. I've already spent four days out on Long Island, and based on that small sample, this summer will be an adventure.

I'm really excited to work for the tribe. This spring, as a part of my Environmental Studies capstone project, I am working with the Bad River Natural Resources Department to create an outreach video and a report on threats and solutions to threats for threatened and endangered species in the Bad River watershed. I have looked at the wood turtle (*Glyptemys insculpta*) and the northern long-eared bat (*Myotis septentrionalis),* and now I get to observe and help save the Piping Plover *(Chaladrius melodus).* I hope to meet a lot of new faces this summer. After a workweek on the island, these new faces will be a fresh interruption from my solitude.

Save the Date!

Bad River
Lake Superior Day Celebration

This event will be open to everyone, honoring our connection, both environmentally and culturally, to beautiful, Lake Superior.

- Educational booths
- cultural booths
- cultural demonstrations
- food

Date: Friday, July 18, 2014

Time: 11AM-3PM

Place: Joe Rose Residence, Lake Road, Odanah, WI

Hosted By:
Bad River Natural Resource Department

Questions or comments ?
Contact: Stephanie Julian
715-682-7123 ext. 1589
NRDOutreach@badriver-nsn.gov

*Printed on 30% PCW Acid-Free Paper, 100% Recyclable

BAD RIVER NATURAL RESOURCES

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Chief Blackbird Center
72682 Maple Street
Odanah, WI 54861

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We're On The WEB!
Www.badriver-nsn.gov

Photo by Daniel Wiggins *"2014 Bad River Falls"*

Photo by Lacey Hill-Kastern *"Ice on the Bay"*

-MISSION STATEMENT-

The Department strives for resource management which both conserves the natural resources for the future generations and provide for the needs of the present. The departments existence reflects the importance the Bad River Tribe places on its right and ability to exercise sovereignty, self-determination and self-regulation in the area of natural resource management.