Yellow River Headwaters Watershed

Watershed Improvement Review Board Final Report

Project # WIRB 1301-001: January 1, 2014 to February 28, 2017
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Project Background

The Yellow River Headwaters Watershed Project (YRHW) was developed in 2008 in response to the Iowa DNR placing the stream on Iowa's 303(d) List of Impaired Waters due to excessive bacteria levels; alongside nutrient and sediment loading (a TMDL was completed in 2012 and a Watershed Management Plan in 2012). The Winneshiek Soil and Water Conservation District (SWCD) and Allamakee SWCD were fortunate enough to receive a Watershed Protection Funds (WSPF) grant from the Iowa Department of Agriculture & Land Stewardship (IDALS) to support our efforts in 2009 and an Iowa DNR EPA-319 grant was awarded in 2013. WIRB has committed funding in support of the project with investments of grants in 2010 and 2014. The SWCD committed to peruse WIRB grants to increase the available cost share dollars to effectively leverage partners' funds through implementation of crucial Best Management Practices (BMPs) in the targeted areas in the watershed.

The YRHW encompasses approximately 26,119 acres or 16.8% of the overall area of the greater Yellow River Watershed (YRW). Locally, there are two identified stream stretches in the YRHW, the North Fork of the Yellow River and the Yellow River main. As its name implies, the YRHW is the headwaters of the Yellow River and as such plays an important role in the water quality of the Yellow River and the eco-tourism of the region (southeastern Winneshiek and southern Allamakee Counties). The geology, ecology, topography and land use in the YRHW are vastly different from the rest of the YRW. Agriculture (72% of the watershed) rather than forests dominate the YRHW and highly fertile uplands tend to comprise more tile drainages than cold-water springs that replenish the river.

The vast majority (94%) of landowners surveyed also indicated that they believed the water quality in the YRHW was in need of improvement and felt that changes in agricultural practices and rural land use were the biggest factors contributing to water quality impairments.

As listed from the TMDL nonpoint sources of pathogen indicators include contributors that do not have localized points of release into a stream. In the watershed these sources are: grazing animals, cattle contributions directly deposited in stream, land application of manure, built-up /urban area runoff, wildlife and finally faulty septic tank systems. Watershed analysis reveals the largest bacteria contributions occur during high flow conditions. As noted, the following components of the bacteria loading for most of the flow conditions correlate too; continuous loads from failed septic tanks and livestock in streams and runoff carrying bacteria available for wash off when it rains. Monitoring data displayed elevated levels of ammonia N, *E. coli* bacteria, phosphate as P, nitrate + nitrite as N, turbidity and total suspended solids (TSS). The *E. coli* concentrations reach maximum loads occur during major rains when storm water runoff crests and conversely during dry low flow periods when continuous loads from livestock in the stream, local wildlife, septic tanks, and wastewater treatment plants can cause bacteria colonies to peak. At this time there is no TMDL developed for sediment delivery; calculations from the WMP sediment loading to the YRHW is 47,032 tons per year with 29,407 tons annually from surface erosion and 17,625 tons annually from stream bank erosion.

The delivery of large sediment loads in the YRHW could significantly restrict natural reproduction of trout and smallmouth bass, both of which depend on silt-free cobble or gravel substrate for spawning. High bacteria levels could also pose significant human health risk and have the potential to severely impact local tourism. The Yellow River is a highly utilized water body for recreational activities, including canoeing, kayaking and fishing that greatly enhance the local economy. In addition to supporting large populations of trout, including several naturally reproducing populations, it is home to recreationally sought-after

Small mouth bass populations. The Yellow River has also been approved a part of the State of Iowa Water Trails System, with this designation and the increased exposure that comes along with it will lead to a further demand by outdoor enthusiasts for recreation opportunities and clean water.

Goal 1: Decrease sediment delivery to the YRHW by 50% over the next 3 years.

- **Objective I:** Work with landowners in targeted areas of the YRHW to implement the most effective BMPs to reduce sediment delivery to the stream, thus reducing impact to water quality to the stream

Goal 2: Decrease bacteria loading to the YRHW by 35% over the life of the project.

- **Objective 1:** Work with landowners in the YRHW to implement BMPs to reduce bacteria run-off from open feedlots, change grazing techniques and work on updating/improving septic systems function to reduce bacteria loading

Goal 3: Reduce livestock access to the stream by 75% over the life of the project.

- **Objective 1:** Work with landowners in the YRHW to restrict livestock access to the stream.

Objective 4: Increase the culture of conservation among landowners in the YRHW.

- **Goal 1:** Highlight producer's contributions and investment into project participation and promotion of conservation participation.

Financial Accountability

Funding Source	Approved Application Budget ($)	Actual ($) Invested	Investment Towards Partnership
WIRB	$300,000.00	$112,703.12	8%
WSPF/WPF	$370,125.00	$210,419.05	14%
EQIP	0	$362,144.91	25%
319	$429,899.00	$305,238.07	21%
Landowners	$301,937.00	$434,640.66	30%
IFIP	0	$1,560.00	0%
CRP	0	$26,099.20	2%
Totals	$1,401,961.00	$1,452,805.01	100%

Watershed Improvement Fund contribution: Approved application budget: 21%
Actual: 8%

Best Management Practices (BMPs) were designed by the NRCS engineering specifications to meet their strict and precise engineering standards. Monthly reports were completed to the district commissioners and quarterly / annual reports were submitted to IDALS-DSC, WIRB and IA DNR. The YRHW advisory board met twice annually and an annual meeting with all project partners reviewed or modified plans of conservation practices to reach goals originally set upon the watershed project. Further project accountability was safeguarded through the ongoing use of the maintenance agreements that are used for all IDALS-DSC funded conservation practices to ensure long-term longevity of BMP's and cost effectiveness. Programs such as the Continuous CRP were utilized for its programs (when eligible) with administration being provided by FSA. Finally, BMP's were funded to landowners / producers at a rate not to exceed 75% for all structural practices using the funding sources of WSPF, WIRB, EQIP, and or 319 in any combination according to available funds. Management

practices were set a fair market rates to ensure they enticed cooperation without exceeding prudent distribution of taxpayer funds. This project was led by the Winneshiek County SWCD with assistance from USDA-NRCS and Allamakee County SWCD.

The influence of partners' funds throughout the project was highlighted by the 30% investment of total funds expended by landowners. The resolve by the producers that participated in the watershed project illustrated the need and desire to implement practices that were practical yet met needs of their farming operation.

Watershed Improvement Funds

Grant Agreement Budget Line Item	Total Funds Approved ($)	Total Funds Approved—Amended ($)	Total Funds Expended ($)	Available Funds ($)
Contour Buffer Strips	18,000.00	18,000.00	0.00	**18,000.00**
Cover Crops	36,000.00	36,000.00	35,973.20	**26.80**
Filter Strips	18,000.00	18,000.00	18,000.00	**0.00**
Grade Stabilization Structure	15,000.00	15,000.00	0.00	**15,000.00**
Nitrification Inhibitor	20,000.00	20,000.00	0.00	**20,000.00**
No-Till/Strip-Till	1,500.00	1,500.00	0.00	**1,500.00**
Streambank and Shoreline	60,000.00	60,000.00	0.00	**60,000.00**
Water Sediment Control Basin	62,500.00	62,500.00	439.20	**62,060.80**
Wetland Creation	18,000.00	18,000.00	9,829.29	**8,170.71**
Salary and Benefits	48,000.00	48,000.00	48,000.00	**0.00**
Equipment	1,500.00	1,500.00	461.43	**1,038.57**
Information and Education Activities	1,050.00	1,050.00	0.00	**1,050.00**
Travel and Training	450.00	450.00	0.00	**450.00**
Totals	300,000.00	300,000.00	112,703.12	**187,296.88**

Execution of the planned goals of the project, financial culpability (funds invested) and technical development of practices seemed to be very successful for some practices while other stewardship practices experienced a lack of support or commitment by producers. Landowners participated with distinct vigor during the time of this grants cycle though it seemed funding for practices were decisively by other funding mechanisms. Practices such as Streambank Stabilization was embraced by landowners to the point it exceeded original goaled footage during the funding timeline, but were exclusively funded through federally administered programs such as EQIP which meet the 75% cost-share threshold so

additional partner funding was not needed or fiscally responsible to pay beyond that rate. Detrimental construction techniques would have allowed inferior stewardship practices to be built that may have failed thus discouraging future producer participation and most importantly the risk of squandering publicly-dispensed funds on practices destined to fail.

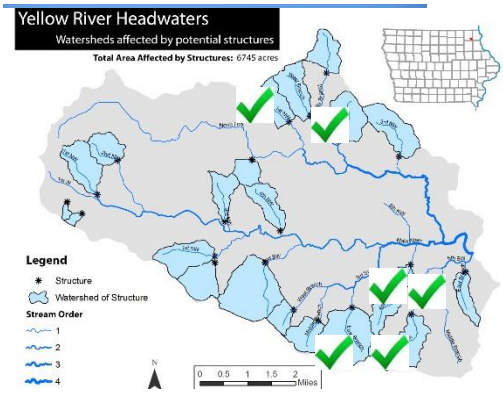
Environmental Accountability

Water monitoring has been a competent tool to quantitate the effectiveness of the BMPs that have been targeted to the watershed's priority areas. Water monitoring has revealed that focused BMP placement such as livestock manure systems, livestock exclusion and grade stabilizations structures have shown the greatest impacts in terms to reductions bacteria, nutrient and sediment loading. Sampling by the district has focused on the following parameters: bacteria (*E.coli*), water temperature, dissolved oxygen, turbidity, chloride, pH, nitrate-N, nitrite-N, phosphate and ammonia. Our sampling data has thousands sampling points tied to our efforts: this complements four years of downstream water sampling by the Allamakee SWCD. Water sampling will continue through the EPA-Iowa DNR 319 funding through federal FY2019 or further depending on available funding. So far sampling has confirmed that our loading issues of bacteria, sediment and nutrients are in correlation to runoff events; this has been exhibited by monitoring summaries from Iowa DNR Watershed Monitoring and Assessment Section. Several sub-watersheds have shown cyclic up and down trends of bacteria loading, these watersheds have known open livestock lots and working land have manure applications upon them, these locales are our next focused area of producer outreach.

Goal 2 of the project devised that a 35% reduction in bacteria was needed to enhance the long-term water quality of the Yellow River. In the priority tributaries that the WIRB Award has helped fund along with partners' obligations, we have seen a cumulative reduction of29% (calculated average of reduction per targeted sub-tributaries in measured bacteria) of bacteria loading. Main branch sampling site #2 along with tributaries sampling sites YRHW 4, 6, 7 and 8 have shown reductions of 13%-43% in loading of bacteria. Monitoring site #2 which is the lowest reach of the Yellow River Headwaters has shown a 43% reduction in bacteria loading, which further correlates the relationship of practice implementation in in tributaries that have shown the highest impute of bacteria loads and now the greatest reductions in bacteria loading. Tumultuous weather patterns during the award period within the watershed drainage has increased storm water runoff and linking the measured runoff has been documented as increased bacteria loading in the 5 sampling sites. The illustration of successful implementation of practices can be presented even with amplified loading of bacteria sums measured reductions in bacteria were documented because of BMPs such as livestock corridor exclusion, riparian buffers and livestock waste systems.

Site	% below 235 MPN/100 ml 2011	% below 235 MPN/100 ml 2013	% below 235 MPN/100 ml 2014	% below 235 MPN/100 ml 2015	% below 235 MPN/100 ml 2016	% below 2880 MPN/100 ml 2011	% below 2880 MPN/100 ml 2013	% below 2880 MPN/100 ml 2014	% below 2880 MPN/100 ml 2015	% below 2880 MPN/100 ml 2016
YRHW1	0	4.76	5.88	12.5	12.5	21.43	23.81	29.41	16.67	25
YRHW2	7.14	4.76	11.76	25	8.33	71.43	66.67	76.47	79.17	83.33
YRHW3	42.86	19.05	11.76	20.83	33.33	100	90.48	88.24	87.5	95.83
YRHW4	7.14	14.29	23.53	25	25	85.71	76.19	88.24	87.5	83.33
YRHW5	21.43	9.52	11.76	20.83	16.67	78.57	80.95	94.12	79.17	83.33
YRHW6	28.57	19.05	29.41	25	33.33	85.71	90.48	94.12	95.83	91.67
YRHW7	14.29	38.1	23.53	20.83	20.83	78.57	71.43	76.47	83.33	87.5
YRHW8	14.29	38.1	23.53	37.5	20.83	92.86	71.43	76.47	75	83.33
YRHW9	14.29	25	12.5	8.33	8.33	78.57	65	81.25	50	83.33
YRHW10	21.43	9.52	6.25	16.67	16.67	64.29	38.1	68.75	41.67	75
YRHW11	'--	--	23.53	20.83	25	'--	'--	64.71	45.83	70.83

Goal 3 (Culture of Conservation) assigned the task of marketing and educating the need of stewardship practices within the set priority areas of the watershed that resulted in 31 different producers having participated in the installation of 70 BMPs resulting in bacteria, sediment and nutrient loading declines during the WIRB Award timeframe of the YRHW project. This time-frame of accelerated stewardship enactment has reduced sediment loading by 7,099 t/y and 9,194.9 lbs. of phosphorus, respectively. In the entirety of the YRHW project to date, BMPs by producers have enhanced water quality supported by reductions of 14,566 t/y sediment and 18,935 lbs. of phosphorus from being transported to the Yellow River.



Emphasis thru project partnerships to strategically address individual sub-watersheds to reduce storm water impacts from cropland areas that have a tendencies to exhibit the highest run-off of sediments and bacteria loading from livestock operations. The picture on the left features installed Water and Sediment Basins along with Grade Stabilization structures cooperatively implemented within the watershed thus far. The diagram on the right exhibits positioning within the watershed of focused sub-watersheds.

Livestock access to streams or wash off from manure application to cropland directly next to flowing waters of the watershed have been a major focus of the watershed project. 149,972 feet of streams within the watershed had livestock impact at the beginning of the watershed project. Currently over 88,607 feet of stream corridor have been buffered reducing the availability of livestock direct deposition of manure or wash off of manure from croplands adjacent to streams or tributaries.

Grade Stabilization structures reduce stormwater-wash off as this structure above does by trapping sediment, nutrients and bacteria that maybe available from cropland upstream of the dam. Also, this attenuation of storm water increases water clarity allowing greater sunlight penetration/ultraviolet light aiding in the depletion of bacteria colonies.

Filter Strips & Riparian Buffers have reduced the impact of livestock access to priority streams and riparian corridor. 59% of the identified stream corridor has had livestock use exclusion enacted, this is ¾'s the way to the 75% use exclusion for the watershed. Proven success in the project thus far is features the use of livestock exclusion practices to by installing just over 328.8 acres of filtering buffers stretched over 16.7 miles priority water-bodies in the life of the entire project.

Installation of livestock storage systems and CNMPs are focused per prescription of the Watershed Management Plan and due to increased bacteria loading as discovered from water sampling efforts. 14 open lots have been eliminated from allowing free wash off of open lots after any precipitation events. These lots have been replaced by tanks, stacking pads, and confinement structures. By proper manure storage and handling bacteria loading have been reduced 7.1e+15 orgs per year.

This project restored 1.5 miles of streambank that had actively eroding banks that averaged 6.5 feet of vertical raw banks that continuously deposited sediment and attached nutrients to the stream. The implementation of this practice reduced sediment loading of 2,622 t/y and reduced phosphorus by 3,408 lbs./yr. 98% of the original goal of 2,676 t/y of sediment reduction was met. These stabilizations were coupled with associated stream corridor practices to reduce nutrient, sediment and bacteria loading to the priority stream

Cover crops have been installed over 1,400 acres of croplands in the watershed that had not utilized cover crops before. These living best management practices not only help soak up nutrients they help reduce soil and bacteria wash off from land applied manure to croplands especially in priority sub watersheds. This is especially important in lands that are dedicated to corn silage that historically lay bare between commodity crops being harvested and replanted.

2 Tile outlet nutrient reduction wetlands were constructed above one the large grade stabilization structures. The tiled croplands that drain into these wetlands are all no tilled, terraced and protected by riparian buffers. This landscape in respects to conservation planning is completed. These wetlands collect all the tile runoff from adjacent croplands, filtering it before it is released back to the tributary then it is filtered through the grade stabilization after that cleansing it is released back into the tributary and onto the priority stream after that.

This is a Heavy Use Livestock crossing; along with livestock use exclusion fencing that was installed within the Yellow River Stream Corridor. This producer has excluded livestock from the stream except for reinforced crossings that allow livestock water for drinking and also as a passageway to rotational grazing paddocks. Grouping of all stewardship practices have reduced bacteria loading by 1.10e+13 orgs per year in this corridor.

By implementing water quality BMPs, producers have positively improved water quality as indicated through water sampling efforts. An environmental indicator of stewardship success has been measured by Iowa DNR fisheries and SWCD staff during fish population surveys by the appearance of burgeoning trout population that has migrated over 5 miles into one of our keystone producers stream corridor restoration project areas. This sought after game fish will undoubtedly increase even more regional emphasis to support water quality efforts in this stream for recreational purposes. The pictures below are depicting the survey team search for species in reengineered stream corridor. The pictures above feature before and after pictures after the implementation of practices.

A use tool in in the changing of conservation culture was to install “Another Outstanding Water Quality Practice” sign at highly visible sites to the general public at sites during and after the implementation, construction and post-construction time frames. This brought a connection to the casual observer or interested landowner of what a practice may look like and spur the recognition that a similar practice may be fitting for their own properties.

A large field day was held in July that featured cover crops, stewardship practices, and rainfall simulator with different ground cover types and alternative seeding methods of cover crop applications. 50+ individuals witnessed a cover crops over seeder demonstration, learned about urban stormwater BMPs, reviewed conservation planning initiatives, nutrient loading reducing practices and soil health.

Practice	Unit	Approved Goals	Goals Accomplishments	Percent Completion
Terraces (Ft)	Ft.	15,000	8,829	59%
Sediment Basin (NBR)	No.	27	6	22%
Grass Waterways (Ac)	Ac.	12	7	58%
Grade Stabilization Structures (NBR)	No.	3	2	66%
Cover Crops (Ac)	No.	1,200	1,410.80	118%
Filter Strip / Buffers (Ac)	Ac.	60	86	143%
Summer Construction (Ac)	No.	75	73.7	98%
Waste Storage Systems (NBR)	No.	6	3	50%
Nutrient Management Plans (NBR)	No.	9	3	33%
Diversions (NBR)	No.	12	0	0
Livestock Exclusion (Ft)	Ft.	15,000	21,062	140%
Use Exclusion (Ac)	Ac.	75	32.6	43%
Livestock Watering System (Ft)	No.	6	0	0%
Streambank Stabilization (Ft)	Ft.	10,500	7,310	70%
N-Inhibitors (Ac)	Ac.	3,000	0	0%
Tile Outlet Wetlands (NBR)	No.	6	2	33%
Heavy Use Protection (NBR)	No.	8	8	100%
No-Till / Strip Till	Ac.	75	0	0%
Contour Buffers (Ac)	Ac.	60	0	0%
Pasture / Hayland Planting (Ac)	Ac.	150	14.3	10%
	* Denotes WIRB Funded BMPs			

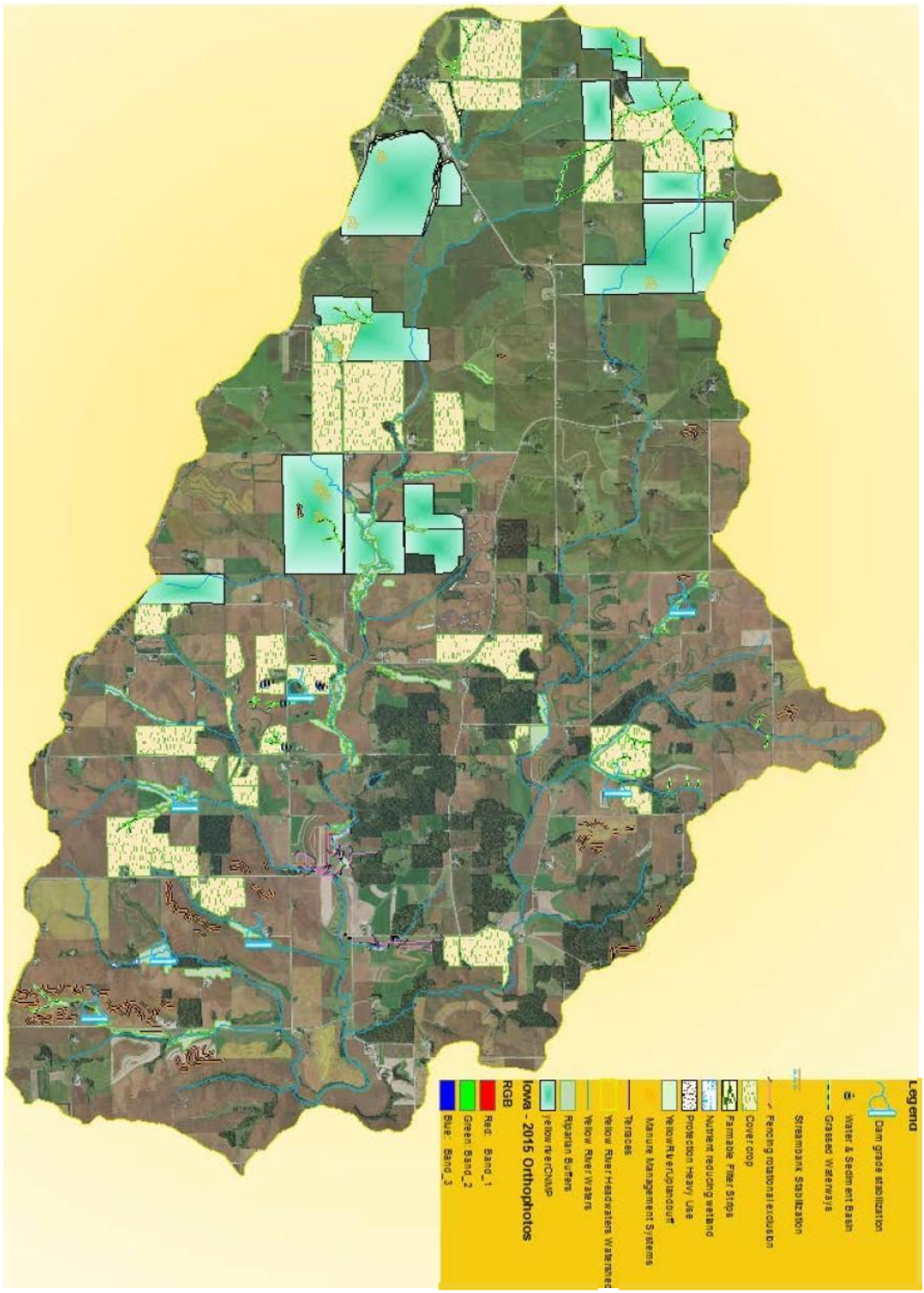
Program Accountability

Anticipated outcomes of the project for the timeline of this WIRB Award were moderate to exceeding goals depending on the numerical percentages of BMPs completed. In summation it was unfortunate that all the goals that were originally set were not reached or exceeded at a 100% rate. Practices such as Filter Strips, Cover Crops, and Streambank Stabilization met or exceeded set goals of the project. While practices such as Contour Buffers Strips, Water and Sediment Basins and Grade Stabilization Structures seemed to falter, the reasoning from landowners was because of commodity prices or lack of wanting to invest into such large projects. It was interesting though that landowners were readily acceptable of management practices that had little dirt moving or construction costs involved and didn't have extended financial weight to the implementation. The practice of N-Inhibitors was not applied largely because after the grant was awarded research had shown that inhibitors had caused adverse effects to soil health and was counterproductive to stewardship principals as set my project advisors and SWCD commissioners.Ultimately going forward with the this project, support by producers with investments in BMP construction windows will be the vast deciding factor in water quality success of YRHW Water Quality Project. Significant gains in the culture of conservation, stewardship practice implementation and overall strides in appreciation for the resources have been made.

Continued collaboration by producers and the partners' awarded funds have enduring potential to influence the enhancement of one of Iowa's ecological gems and eco-recreational destinations.

Reporting and funding allocations were administered by the project coordinator, including plans of operation, supplemental funding/budget reconciliation, project spreadsheet with updated balances and the annual district report. The project coordinator led the aggressive marketing of the watershed effort and worked diligently to inform the public on the importance of water quantity/quality to residents in and out of the water quality focus area. The project coordinator worked on valued partnerships such as with Iowa DNR Fisheries personnel to intensively enrich the aquatic habitats within the stream corridor and oversee the installation of thermographs. The project coordinator managed the collection, analysis and proper documentation of water sampling efforts to ensure the continued logging of data that pertains to the removal of the YRHW from the Impaired Waters List. The project coordinator operated tools such as the IDALS-DSC/IA DNR pollutant delivery calculator as a measurement tool to calculate the reduction of sediment and nutrient delivery to the priority waterbody. Also, these tools assisted in selecting one conservation practice over another in the case of getting more "bang for the buck" when estimating BMP placement. BMPs were designed to stringent USDA-NRCS engineering specifications to meet their strict and precise engineering standards. Monthly reports were presented to Winneshiek SWCD commissioners to ensure district and quarterly/annual reports would be submitted to IDALS- DSC, WIRB and IA DNR. The YRHW advisory board met twice annually and an annual meeting with all project partners reviewed or modified plans of conservation practices to reach goals originally set upon the watershed project. Further project accountability was safeguarded through the ongoing use of the maintenance agreements that are used for all WIRB, IDALS-DSC, Iowa DNR funded conservation practices to ensure long-term longevity of BMPs and cost effectiveness. Programs such as the Continuous CRP were utilized for its programs (when eligible) with administration be provided by the Farm Service Agency. Finally, BMPs implemented for landowners/producers at a rate not to exceed 75% for all structural practices using the funding sources of WIRB, WSPF, EQIP and/or 319 in any combination according to available funds. Management practices stood at set fair market rates to ensure they enticed cooperation without exceeding prudent distribution of taxpayer funds.

One common barrier that became apparent throughout the project was how to reach the "human-shed" as it was called in the awareness campaign plan prepared for the watershed project. Winneshiek SWCD Commissioners, YRHW watershed coordinator and team partners suggested that Calmar and Postville be included in the watershed marketing campaign, even though these communities are geographically located outside the YRHW. Many watershed residents travel outside the watershed to Calmar or Postville for social, athletic events and education (elementary through high school), including post-secondary education at Northeast Iowa Community College. To overcome this the SWCD made a concerted effort to market the project through methods such as being sponsors for school athletic booster clubs, sponsor field days, sponsor BMPs , featured articles in annual reports, radio show interviews, sent newsletters and quick information post cards encouraging participation in the effort.


Legend
Dam grade stabilization
Water & Sediment Basin
Grassed Waterway
Streambank Stabilization
Fencing rotational exclusion
Cover crop
Farmable Filter Strips
Nutrient reducing wetland
Protection Heavy Use
Yellow River Upland out
Manure Management Systems
Terraces
Yellow River Headwaters Watershed
Yellow River Wayare
Riparian Buffers
Yellow River CNMP
Iowa - 2015 Orthophotos
RGB
Red: Band_1
Green: Band_2
Blue: Band_3