State Interagency Missouri River Authority (SIMRA) Meeting
Monday, November 17, 2014; 2:30-4:00 pm
Wallace State Office Building, Conference Room 2 N
502 E. 9th St., Des Moines, IA

SIMRA member attendees: Chuck Gipp, Bill Ehm, Bruce Trautman and Sharon Tahtinen (DNR); Amy Christensen (IUB); Harold Hommes (IDALS); Sherry Timmins (EDA-via phone); Sam Hiscocks (DOT); and Doug Hoelscher (IGOV – via phone)

Guest attendees: Shawn Shouse (MRRIC); Lori McDaniel (DNR); John Crotty (Iowa Environmental Council); Michael Anderson (DNR); Jace Mikels (Senate Democratic Caucus staff); Leo Ettleman (R2M); Jake Hanson (IDALS); Scott Olson (R2M); David Sieck (Iowa Corn)/RRM); Deb Kozel (Legislative Services Agency); Mary Braun (House Democratic Caucus staff); Angi Bruce (DNR); Matt Lechtenberg (IDALS); Pat Hall (Homeland Security); Rick Robinson (Iowa Farm Bureau); Tom Oswald (Homeland Security)
Via Phone: Virginia Soelberg (Sierra Club); Jane Clark; Scott Belt (Pottawattamie County Board of Supervisors); Chris Larson (DNR); Pete Hildreth (DNR)

Welcome and Introductions – Bill Ehm, Administrator – Environmental Services Division – (DNR)

SIMRA Business:

Approve Agenda – Approved Unanimously
Approval of Meeting Summary – October 13, 2013 Meeting – Approved Unanimously

Winter Outlook – Craig Cogil, Senior Meteorologist, NOAA
At this time, ENSO (El Nino/Southern Oscillation) conditions are neutral but have been trending toward warmer El Nino conditions. Despite this slight warming, it is rather late in the year for impacts to occur during the winter months in Iowa should the incipient El Nino conditions continue to strengthen. This information, in combination with conflicting guidance from other inputs, suggests little predictability for the winter forecast across much of Iowa. Therefore, there are equal chances for above, normal, or below normal temperatures across Iowa and much of the Midwest for the period from December through February. The same holds true for precipitation across the western two-thirds of Iowa. However, in eastern Iowa, there is a slightly enhanced chance of seeing below normal precipitation during this three month period.

Iowa Nutrient Reduction Strategy Update – Matt Lechtenberg - Water Quality Initiative Coordinator, Iowa Department of Agriculture and Land Stewardship; Adam Schnieders – Environmental Program Supervisor, DNR

<u>Non-Point Source</u>
Upon completion of the Iowa Nutrient Reduction Strategy (NRS), the Iowa Legislature established funding during the 2013 Legislative session specifically targeted to implementation efforts around the non-point source section of the Iowa Strategy. This effort is called the Water Quality Initiative (WQI) and is administered through the Iowa Department of Agriculture and Land Stewardship (IDALS), the co-author and non-point source lead of the Iowa NRS. The four

main components of the Iowa WQI will provide: Outreach/Education, Statewide Practice Implementation, Targeted Demonstration Watershed Projects, and Tracking/Accountability.

Point Source

One of the goals of the point source component was to issue 20 NPDES permits for facilities listed in the NRS that included the feasibility study requirement within the first year of the Strategy. As of May 31, 2014, 21 permits were issued with the feasibility study requirement included. There are currently 147 facilities included in the Strategy. The intent is to reissue approximately 20 permits per year that include the feasibility study with the expectation that after seven years all Major facilities will be reissued with the feasibility study provisions included.

Iowa Hydrology Summary – Michael Anderson, Environmental Engineer Senior, DNR
2014 has been a hydrologically good year for Iowa. Precipitation amounts and streamflow levels have generally been at or above normal for the bulk of the year. Furthermore, groundwater levels have recovered (from the effects of the 2012 drought) in nearly all of the State. Soil moisture is also in good shape. However, there are areas of NW Iowa that are dry enough and bear watching. That is, the drought is gone from Iowa, but conditions are dry just to the north in southwestern Minnesota. DNR staff will continue to monitor this situation. Overall, the outlook is far more favorable than it was at this time last year.

Shallow Water Habitat Projects Update - Kelly Crane, Senior Program Manager for the Missouri River Recovery Program and **2015 Basin Runoff Outlook** – Kimberly Thomas, Chief, Readiness Branch - U.S. Army Corps of Engineers - Omaha District (via phone – no handouts provided) Kelly Crane provided a brief overview on the status of Shallow Water Habitat projects in a variety of stages – from proposed to completion. Kimberly Thomas provided an overview of flow conditions on the Missouri River. She indicated that flow out of Gavins Point Dam is currently at 36,000 cfs. The Corps plans to reduce flow to 19,000 cfs on about December 1 and to maintain this flow through the winter months. This level of flow is planned to draw down the levels in the reservoirs so there is sufficient space to accommodate spring rains and winter snow melt to avoid flooding next spring. For further information on either of these topics: Kelly.A.Crane@usace.army.mil or Kimberly.S.Thomas@usace.army.mil

Missouri River Recovery and Implementation Committee (MRRIC) Update – Shawn Shouse, MRRIC Representative (MRRIC May 24 and August 15 Press Releases attached)

Public Participation:

Leo Ettleman, Scott Olson and David Sieck, representatives of Responsible River Management, spoke to the group about a number of concerns they have regarding the management of the Missouri River, including issues related to the effectiveness of river restoration projects; the need to manage the river to maximize flood management; the impacts of the flood on private lands and the practice of dumping dredge materials from the SWH projects into the river.

The group mentioned that more opportunity is needed on SIMRA agendas to discuss issues such as the effects of river restoration projects, flood management, landowner impacts and barge/navigation issues.

Discussion for Next Meeting and Other Business
SIMRA agreed to hold a follow-up meeting within the next 30 days and to poll stakeholders for agenda topics. All stakeholders on the regular meeting distribution list; agency representatives on SIMRA and input from local leaders such as the County Boards of Supervisors will be contacted to identify topic/speakers.

SIMRA discussed scheduling two meetings in 2015 – the first in late June/early July in western Iowa and a late fall meeting November/December in Des Moines. Additional meetings can be convened as necessary.

Adjourn

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Conference Call Instructions:

Calling into the Wallace Building:

Dial (866) 685-1580. When the call is answered follow the prompts by entering the conference code of **4510673319** followed by #.

AGENDA

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Approve Agenda

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Discussion for 2015 Schedule of Meetings

Other Business

Adjourn

Long Range Forecast

Process and Outlook

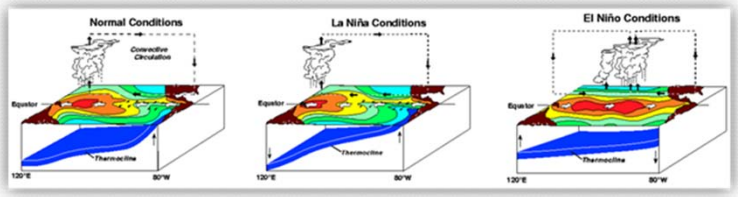
Craig Cogil
Senior Forecaster
NWS Des Moines
November 17,2014

Forecast Tools used in the Seasonal Outlooks

- ENSO – El Nino/La Nina and Southern Oscillation
- Optimal Climate Normals – Trends
- Canonical Correlation Analysis – Analogs
- Climate Forecast System – Ensemble Models
- Soil Moisture Analog – Used only in warm season

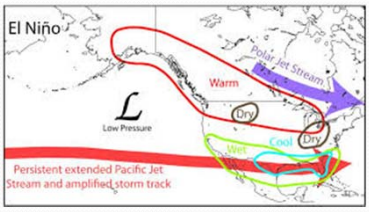
Forecast Tools - ENSO

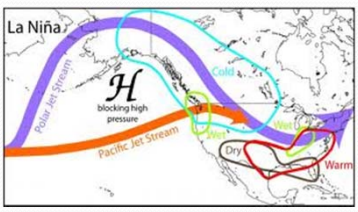
- Sea surface temperature anomalies in eastern and central Pacific Ocean near the equator. The warm anomaly is El Nino, the cool is La Nina.



Forecast Tools – ENSO

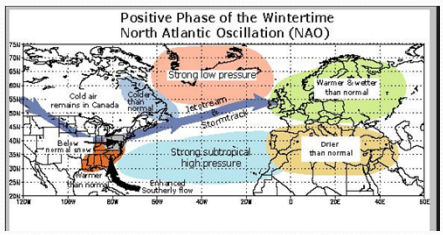
- Often the key factor in determining long term forecasts.
- Interseasonal duration acts to influence tropical and mid-latitude weather for time periods usually longer than a given season.
- The stronger the event, the more likely "typical" impacts of the ENSO pattern will play out.

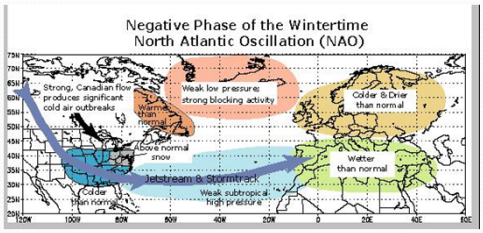




Forecast Tools – ENSO

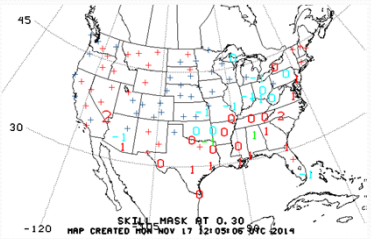
- Marginal events or neutral conditions diminish the usefulness of this tool.
- All events can be trumped by intraseasonal variations such as the North Atlantic Oscillation (NAO) and Madden-Julian Oscillation (MJO). These only have predictability generally to a few weeks.





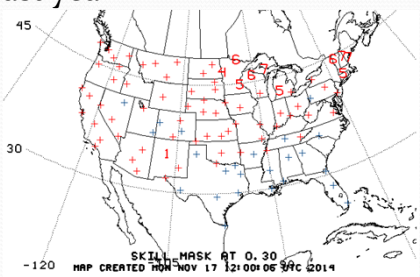
Forecast Tools - OCN

- Optimal Climate Normals predict temperature and precipitation on the year-to-year persistence of the observed average anomaly – In other words this tool is looking at the trend and projecting it forward
- Uses 10 years of data for temperature and 15 for precipitation.
- This tool emphasis long term trends and multi-year regime effects.
- The trend is your friend
  - Until it isn't!



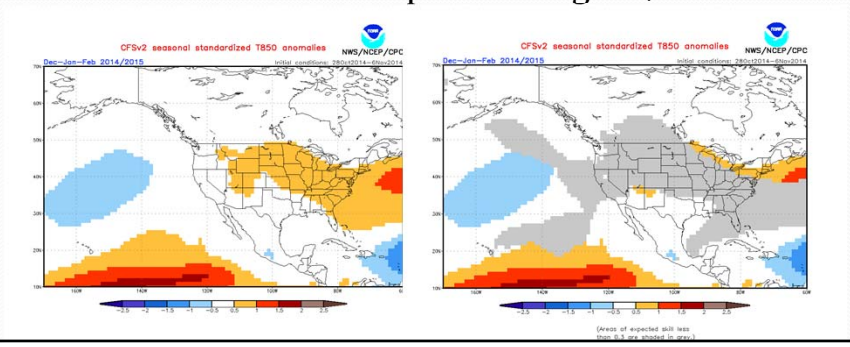
Forecast Tools - CCA

- Canonical Correlation Analysis – predicts the evolution of patterns of temperature and precipitation based on patterns of specific data.
  - Global Sea Surface Temperatures
  - 700mb Heights
  - U.S. Temp and Pcpn for past year
- Essentially an analog correlating current conditions with past patterns to come up with a forecast

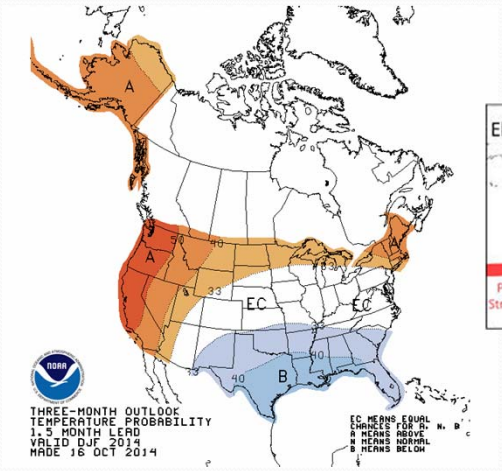


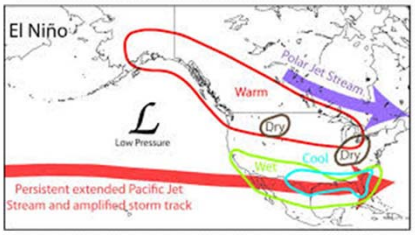
Forecast Tools - CFS

- The Climate Forecast System is an Ensemble Mean Forecast
- 40 Forecast Members
- Skill Mask applied to show where historical forecasts in similar situation have performed good/bad

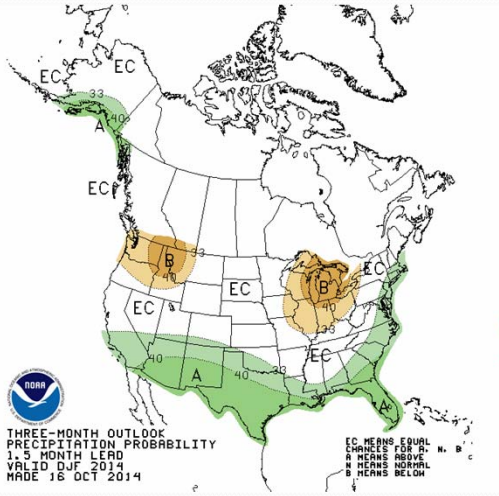


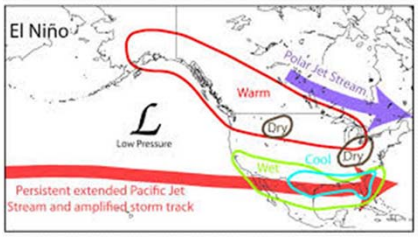
Winter Outlook - Temperature





Winter Outlook - Precipitation





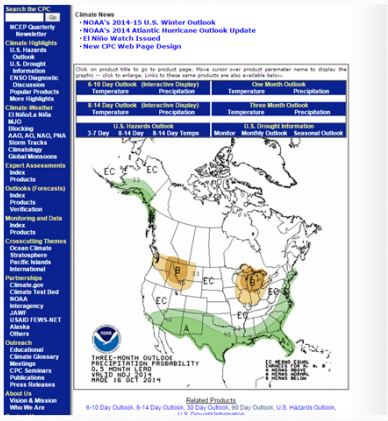
Winter Outlook - Summary

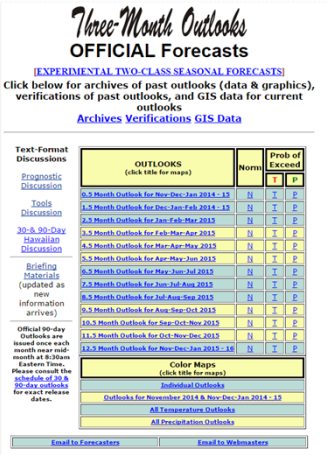
1980	0.5	0.4	0.3	0.3	0.4	0.4	0.3	0.1	-0.1	0.0	0.0	-0.1
1981	-0.4	-0.6	-0.5	-0.4	-0.3	-0.3	-0.4	-0.4	-0.3	-0.2	-0.2	-0.1
1982	-0.1	0.0	0.1	0.3	0.5	0.7	0.7	1.0	1.5	1.9	2.1	2.2
1983	2.2	1.9	1.5	1.2	0.9	0.6	0.2	-0.2	-0.5	-0.8	-0.9	-0.8
1984	-0.5	-0.3	-0.3	-0.4	-0.5	-0.5	-0.3	-0.2	-0.3	-0.6	-0.9	-1.1
1985	-1.0	-0.9	-0.7	-0.7	-0.7	-0.6	-0.5	-0.5	-0.5	-0.4	-0.4	-0.4
1986	-0.5	-0.4	-0.2	-0.2	-0.1	0.0	0.3	0.5	0.7	0.9	1.1	1.2
1987	1.2	1.3	1.2	1.1	1.0	1.2	1.4	1.6	1.6	1.5	1.3	1.1
1988	0.8	0.5	0.1	-0.2	-0.8	-1.2	-1.3	-1.2	-1.3	-1.6	-1.9	-1.9
1989	-1.7	-1.5	-1.1	-0.8	-0.6	-0.4	-0.3	-0.3	-0.3	-0.3	-0.2	-0.1
1990	0.1	0.2	0.3	0.3	0.2	0.2	0.3	0.3	0.4	0.3	0.4	0.4
1991	0.3	0.2	0.2	0.3	0.5	0.7	0.8	0.7	0.7	0.8	1.2	1.4
1992	1.6	1.5	1.4	1.2	1.0	0.7	0.3	0.0	-0.2	-0.3	-0.2	0.0
1993	0.2	0.3	0.5	0.6	0.6	0.5	0.3	0.2	0.2	0.2	0.1	0.1
1994	0.1	0.1	0.2	0.3	0.4	0.4	0.4	0.4	0.5	0.7	1.0	1.2
1995	1.0	0.8	0.6	0.3	0.2	0.0	-0.2	-0.4	-0.7	-0.8	-0.9	-0.9
1996	-0.9	-0.8	-0.6	-0.4	-0.3	-0.2	-0.2	-0.3	-0.3	-0.3	-0.4	-0.5
1997	-0.5	-0.4	-0.1	0.2	0.7	1.2	1.5	1.8	2.1	2.3	2.4	2.3
1998	2.2	1.8	1.4	0.9	0.4	-0.2	-0.7	-1.0	-1.2	-1.3	-1.4	-1.5
1999	-1.5	-1.3	-1.0	-0.9	-0.9	-1.0	-1.0	-1.1	-1.1	-1.3	-1.5	-1.7
2000	-1.7	-1.5	-1.2	-0.9	-0.8	-0.7	-0.6	-0.5	-0.6	-0.6	-0.8	-0.8
2001	-0.7	-0.6	-0.5	-0.4	-0.2	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.3
2002	-0.2	0.0	0.1	0.3	0.5	0.7	0.8	0.8	0.9	1.2	1.3	1.3
2003	1.1	0.8	0.4	0.0	-0.2	-0.1	0.2	0.4	0.4	0.4	0.4	0.3
2004	0.3	0.2	0.1	0.1	0.2	0.3	0.5	0.7	0.8	0.7	0.7	0.7
2005	0.6	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.0	-0.2	-0.5	-0.8
2006	-0.9	-0.7	-0.5	-0.3	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.0
2007	0.7	0.3	-0.1	-0.2	-0.3	-0.3	-0.4	-0.6	-0.8	-1.1	-1.2	-1.4
2008	-1.5	-1.5	-1.2	-0.9	-0.7	-0.5	-0.3	-0.2	-0.1	-0.2	-0.5	-0.7
2009	-0.8	-0.7	-0.5	-0.2	0.2	0.4	0.5	0.6	0.8	1.1	1.4	1.6
2010	1.6	1.3	1.0	0.6	0.1	-0.4	-0.9	-1.2	-1.4	-1.5	-1.5	-1.5
2011	-1.4	-1.2	-0.9	-0.6	-0.3	-0.2	-0.2	-0.4	-0.6	-0.8	-1.0	-1.0
2012	-0.9	-0.6	-0.5	-0.3	-0.2	0.0	0.1	0.4	0.5	0.6	0.2	-0.3
2013	-0.6	-0.6	-0.4	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.4
2014	-0.6	-0.6	-0.5	-0.1	0.1	0.1	0.0	0.0	0.2			

- Neutral ENSO conditions with incipient El Nino conditions
- Late in the game for El Nino to develop and influence the winter season
- Watch for influence from intra-seasonal variations such as NAO and MJO which may tend to dominate
- Confidence in forecast low

Information

- All this information can be found on the Climate Prediction Center Website:
  - www.cpc.ncep.noaa.gov





Contact Info

- craig.cogil@noaa.gov
- 515-270-4501

Iowa Nutrient Reduction Strategy

Adam Schnieders
NPDES Program Supervisor
Iowa Department of Natural Resources

Matt Lechtenberg
Water Quality Initiative Coordinator
Iowa Department of Agriculture and Land Stewardship

November 17, 2014

Nutrients and Water Quality

- Nutrient over-enrichment is creating problems for recreation, drinking water and aquatic life.
  - *Big Creek Lake (Polk Co.)*
    Recreation
  - *Lake Rathbun (Appanoose Co.)*
    Drinking Water Supply
  - *Middle Fork of South Beaver Creek (Grundy Co.)*
    Aquatic Life
  - *Gulf of Mexico Hypoxia*

Swan Lake, June 2011

IOWA DEPARTMENT OF NATURAL RESOURCES
CHUCK GIPP, DIRECTOR

Why this strategy?

- Excessive nutrients can cause water quality problems
  - In state
  - Downstream
- Numeric nutrient criteria development presents challenging problems
  - No definitive cause & effect relationship
- Tough for Iowa to apply numeric nutrient criteria
  - Difficult to comply with permit limits and costly to try
- A different approach needed

PS and NPS Common Threads

- Acknowledgement of the problem
- Recognition that traditional approaches are not workable (e.g. cost, technically)
- Willingness to want to do something now to make progress
- Needs to be practical in its implementation

Iowa Strategy General Approach

1) Achieve nutrient load reductions through technology-based actions, while

2) Continuing to assess and evaluate the nutrient water quality standards

PS/NPS Collaboration

- PS account for 8% of the TN and 20% of the TP annually
- NPS account for 92% of the TN and 80% of the TP annually
- **Both NPS and PS play important roles on an annual and seasonal basis for Iowa water quality**

PS/NPS Collaboration

- Nonpoint sources
  - 41% reduction of statewide N load
  - 29% reduction of statewide P load
- Point sources
  - 4% reduction of statewide N load
  - 16% reduction of statewide P load
- **Combined 45% N and P reductions**

Point Source Strategy

- In Iowa point sources contribute 8% of the TN and 20% of the TP
- Point sources can have greater impacts at low flows and certain watersheds
- Working closely with CWA regulated community
- Use existing rules (Chapter 567 IAC Chapter 62)
- Use technology-based limits in lieu of nutrient criteria
  - Limits based on the effect of the pollutant in the water and feasibility and reasonableness of treating such pollutant

Point Source Strategy

Focus on:

- **102** major municipal wastewater treatment plants
- **29** major industries (10 of which have nutrients)
- **17** minor industries with biological treatment for process waste
- **Total of 148 (130 expected to have sig. nutrient loads)**

- Treat more than 1 million gallons of wastewater a day
- Handle 80 percent of all municipal wastewater
- Provide wastewater treatment for 55-60 percent of Iowa's population

Results

At the 130 wastewater treatment plants included in the strategy:

- Assume 25 mg/L total nitrogen (TN) and 4 mg/L total phosphorus (TP) discharge concentrations
- Use annual average flows
- Use Biological Nutrient Removal technology limits (10 mg/L TN and 1 mg/L TP)

Currently Point Source Facility Loading

18,300 tons/yr TN
2,900 tons/yr TP

After implementation

7,300 tons/yr TN
730 tons/yr TP

2/3 to 3/4 nutrient reduction possible

Results

At the watershed level

- Using GIS (Geographic Information System) with ambient data (132 samples from 58 sites over 11-year period) – aka - the 2012 Nutrient Budget

Point Source State-wide Loading Currently

~ 8 percent TN

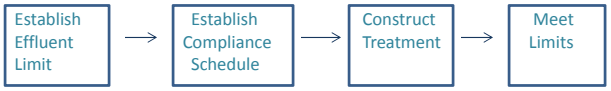
~ 20 percent TP

State-wide Load Reduction after Implementation

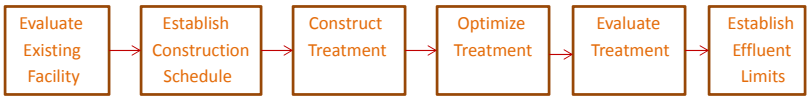
~ 4 percent overall TN load reduction

~ 16 percent overall TP load reduction

Normal Permitting Process



Nutrient Permitting Process



Cost and Affordability

Estimated Costs for BNR Improvements for Muncipal Majors (Target Effluent TN = 10 mg/L, Target Effluent TP = 1 mg/L)

Treatment Type	# of Facilities	Combined Design AWW Flow (MGD)	Combined Annual Average Flow[1] (MGD)	Total Capital Cost ($M)	Total Annual O&M Cost ($M)	Total Present Worth Cost ($M)[2]	Total Annual Cost ($M)	$/1,000 gallons Treated[3]	Weighted Monthly Cost/Household[4]	Weighted % of MHI[4]
Activated Sludge	56	533	355	348	25	686	51	0.39	7.75	0.18%
Fixed Film	37	101	67	430	7	524	39	1.59	25.83	0.73%
Aerated Lagoon	9	11	8	110	3	147	11	3.92	85.16	2.13%
Totals	102	645	430	887	35	1,358	101	0.64	11.85[5]	0.29%[5]

Estimated Costs for BNR Improvements for all Industries with Biological Treatment (Target Effluent TN = 10 mg/L, Target Effluent TP = 1 mg/L)

Treatment Type	# of Facilities	Combined Design Flow (MGD)	Total Capital Cost ($M)	Total Annual O&M Cost ($M)	Total Present Worth Cost ($M)[1]	Total Annual Cost ($M)	$/1,000 gallons Treated[2]
Activated Sludge	20	44.2	29.3	2.0	56.1	4.2	0.26
Fixed Film	1	0.6	2.7	0.04	3.3	0.2	1.06
Aerated Lagoon	7	5.8	86.5	2.20	116.0	8.6	4.05
Totals	28	50.7	118.5	4.2	175.5	13.1	0.71

Total Present Worth Cost

= 1.53 ($B)

Total Capital Cost

= 1.00 ($B)

Progress to Date on Point Source Side

- 35 NPDES Permits issued with studies to date; goal is 20/year
- Facilities beginning to submit schedules to install BNR
- Progress reported bi-monthly at the WRCC meetings; annual report in May
- Nutrient loading workgroup efforts ongoing
  - Working toward better & quicker loading estimates
- Looking at new areas

Iowa Water Quality Initiative
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IOWA WATER QUALITY INITIATIVE

Moving From Strategy to Implementation

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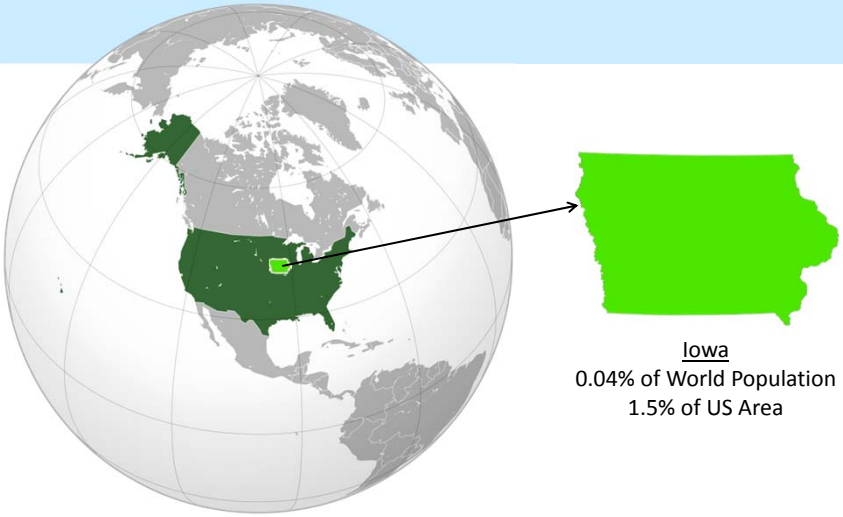

Iowa
0.04% of World Population
1.5% of US Area

United States
4.5% of World Population

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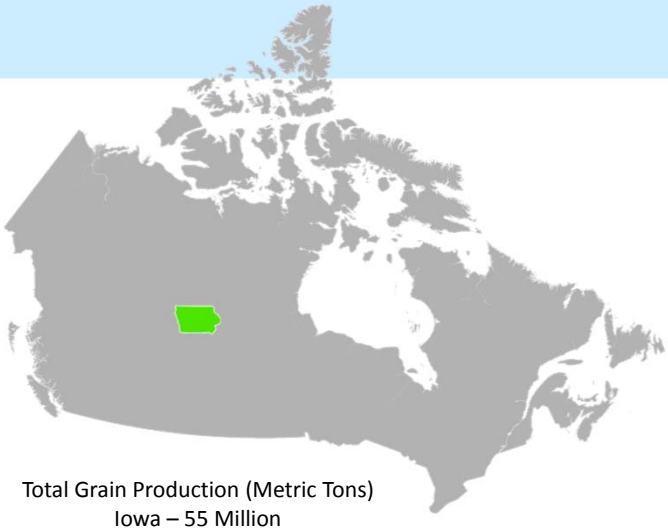

Total Grain Production (Metric Tons)
Iowa – 55 Million
Canada – 45 Million

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Total Soybean Production (Metric Tons)

China – 15 Million
Iowa – 14 Million

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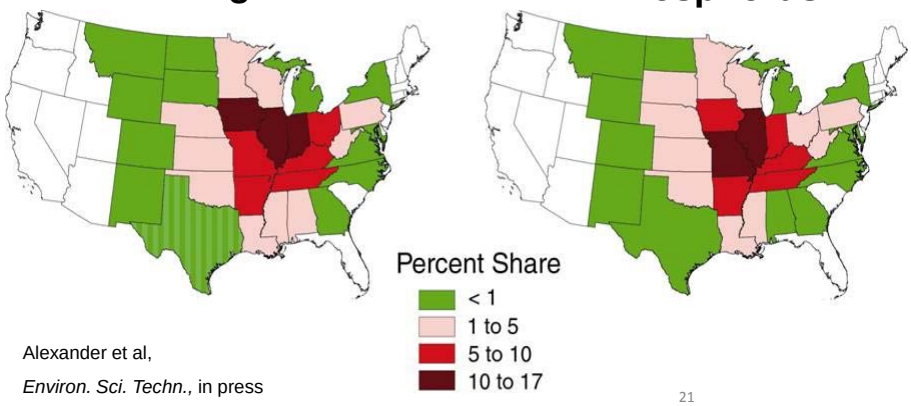
NUTRIENT DELIVERY TO THE GULF OF MEXICO

State shares of the total annual nutrient flux

Nitrogen **Phosphorus**



Alexander et al,
Environ. Sci. Techn., in press

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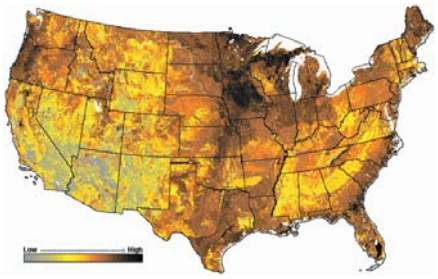
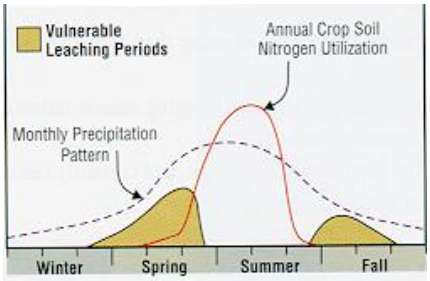
NUTRIENT REDUCTION STRATEGY



- Nutrient impairment is beyond the usual culprit of mismanagement of fertilizers and manures, but more to historic changes in land use and hydrology.

- Current major cropping system leaves soil vulnerable to erosion and nutrient leaching.
- Markets and Technological Advances have shifted cropping patterns and increased productivity.
- Have the most tools available to date and will still continue to develop and adopt new technologies



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cleanwater IOWA CLEANWATERIOWA.ORG

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Nitrogen Practices

Nitrogen moves primarily as nitrate-N with water

	Practice	Comments	% Nitrate-N Reduction[1]	% Corn Yield Change[2,4]
			Average (SD[3])	Average (SD[3])
Nitrogen Management	Timing	Moving from fall to spring pre-plant application	6 (25)	4 (16)
		Spring pre-plant/sidedress 40-60 split Compared to fall-applied	5 (28)	10 (7)
		Sidedress – Compared to pre-plant application	7 (37)	0 (3)
		Sidedress – Soil test based compared to pre-plant	4 (20)	13 (22)[5]
	Source	Liquid swine manure compared to spring-applied fertilizer	4 (11)	8 (13)
		Poultry manure compared to spring-applied fertilizer	-3 (28)	-2 (14)
	Nitrogen Application Rate	Nitrogen rate at the MRTN (8:10 N:corn price ratio) compared to current estimated application rate. (ISU Corn Nitrogen Rate Calculator – http://extension.agron.iastate.edu/soilfertility/nrate.aspx can be used to estimate MRTN but this would change Nitrate-N concentration reduction)	10	-1
	Nitrification Inhibitor	Nitrapyrin in fall – Compared to fall-applied without Nitrapyrin	9 (19)	6 (22)
	Cover Crops	Rye	31 (29)	-6 (7)
		Oat	28 (2)	-5 (1)
	Living Mulches	e.g. Kura clover – Nitrate-N reduction from one site	41 (16)	-9 (32)
Land Use	Perennial	Energy Crops – Compared to spring-applied fertilizer	72 (23)	
		Land Retirement (CRP) – Compared to spring-applied fertilizer	85 (9)	
	Extended Rotations	At least 2 years of alfalfa in a 4 or 5 year rotation	42 (12)	7 (7)
	Grazed Pastures	No pertinent information from Iowa – assume similar to CRP	85	
Edge-of-Field	Drainage Water Mgmt.	No impact on concentration	33 (32)	
	Shallow Drainage	No impact on concentration	32 (15)	
	Wetlands	Targeted water quality	52	
	Bioreactors		43 (21)	
	Buffers	Only for water that interacts with the active zone below the buffer. This would only be a fraction of all water that makes it to a stream.	91 (20)	

Phosphorus Practices

Phosphorus moves primarily with eroded soil

	Practice	Comments	% P Load Reduction[6]	% Corn Yield Change[2]
			Average (SD[3])	Average (SD[3])
Phosphorus Management Practices	Phosphorus Application	Applying P based on crop removal – Assuming optimal STP level and P incorporation	0.8[4]	0
		Soil-Test P – No P applied until STP drops to optimum	17[7]	0
	Source of Phosphorus	Liquid swine, dairy, and poultry manure compared to commercial fertilizer – Runoff shortly after application	46 (45)	-1 (13)
		Beef manure compared to commercial fertilizer – Runoff shortly after application	46 (96)	
	Placement of Phosphorus	Broadcast incorporated within 1 week compared to no incorporation, same tillage	36 (27)	0
		With seed or knifed bands compared to surface application, no incorporation	24 (46)	0
	Cover Crops	Winter rye	29 (37	-6 (7)
	Tillage	Conservation till – chisel plowing compared to moldboard plowing	33 (49)	0 (6)
		No till compared to chisel plowing	90 (17)	-6 (8)
Land Use Change	Perennial Vegetation	Energy Crops	34 (34)	
		Land Retirement (CRP)	75	
		Grazed pastures	59 (42)	
Erosion Control and Edge-of-Field Practices	Terraces		77 (19)	
	Buffers		58 (32)	
	Control	Sedimentation basins or ponds	85	

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NUTRIENT REDUCTION STRATEGY

- Advance environmental stewardship while maintaining agricultural productivity
- Pair the best "in-field" and "off-field" practices together for cumulative effect
- Expanded agribusiness consulting and advisory services to farmers as a means to increase water quality and soil sustainability efforts.
- Seek acceleration of existing conservation programs & development of new technology and market driven approaches

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OUTREACH & EDUCATION

- Provide the tools necessary to ensure success
- Local SWCD or other farmers are great resources
  - Field Days, Webinars, Workshops, Conferences, etc.
  - Financial Assistance
- www.CleanWaterIowa.org
  - Sign-up for periodic newsletter, success stories, etc.
  - Tell the story of agriculture

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WQI DEMONSTRATION WATERSHED PROJECTS

- Targeted to Priority Watersheds to Provide:
  - Demonstration of practices and technologies outlined in science assessment
  - Foster partnerships with wide range of project stakeholders to leverage resources and expand audience.
  - Strong outreach/education components to provide information on practices and adoption of available practices detailed in the Science Assessment
  - Local/regional hubs for demonstrating practices and providing practice information to farmers, landowners, farm managers, peer networks, etc.

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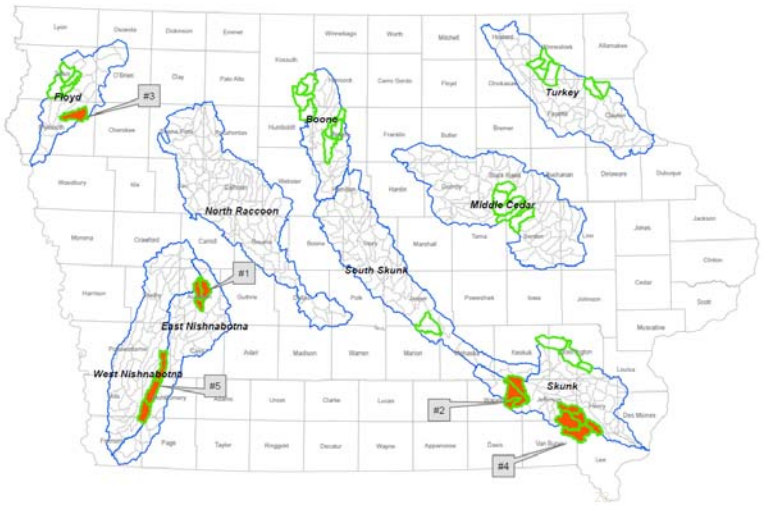
WQI WATERSHED PROJECTS



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WQI DEMONSTRATION WATERSHED PROJECTS

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STATEWIDE EFFORTS

- Statewide efforts
  - Offer incentives to try a new practice from NRS Science Assessment
  - Follow-up efforts to offer the information necessary to improve chances of successful implementation
    - Any new practice adds complexity to already complex weather and management related variables
  - Recruit the help of experienced farmers in providing assistance to new users.

We received 2.5-3.0" of rain last night in parts of SE Iowa. No soil movement on rye cover crop. Cereal rye root growth measured (probed) at 48"

Rye cover cropped fields helped preserve moisture from the hot dry winds in May. Our climate resembled Nebraska-Kansas type environment this spring but we were able to get good soybean emergence in the rye. No replanting here—we feel the long term no-till cover cropped areas fared well.

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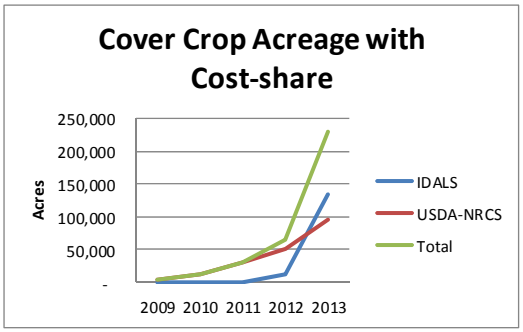
STATEWIDE EFFORTS

Interest is growing…



*Does not account for acres of Cover Crops done privately or through Conservation Stewardship Program contracts.

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STATEWIDE EFFORTS

- Measures of Success:
  - Develop new and expanded frameworks to track progress, beyond ambient water quality monitoring
  - Public/private template for gathering better baseline data and tracking load reductions resulting from conservation practice adoption
  - Report calculated/modeled load reductions from practice adoption

Inputs

People

Funding

Agency resources

Private sector resources

Human

Partner Organizations

Partner Agribusinesses

Farmer knowledge and attitude

Point source communities and management knowledge and attitude

Land

Land use changes
- Net acres cover crops
- Net acres perennials
- Etc.

Practice adoption
- Acres of practice X
- Acres of practice Y
- Etc.

Point source implementation
- Feasibility studies
- Permit applications
- Construction

Water

Calculated load reduction

Measured loads in priority watersheds

Organized watersheds reported load changes

Measured loads at existing monitoring stations

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ADDITIONAL INFORMATION

www.nutrientstrategy.iastate.edu

www.CleanWaterIowa.org

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Iowa Department of Natural Resources

Leading Iowans in caring for our natural resources

November 17. 2014

Update of Hydrologic Conditions

SIMRA

Outline for presentation:

1. Precipitation
2. Streamflow
3. Groundwater
4. State and Regional Dought Monitor

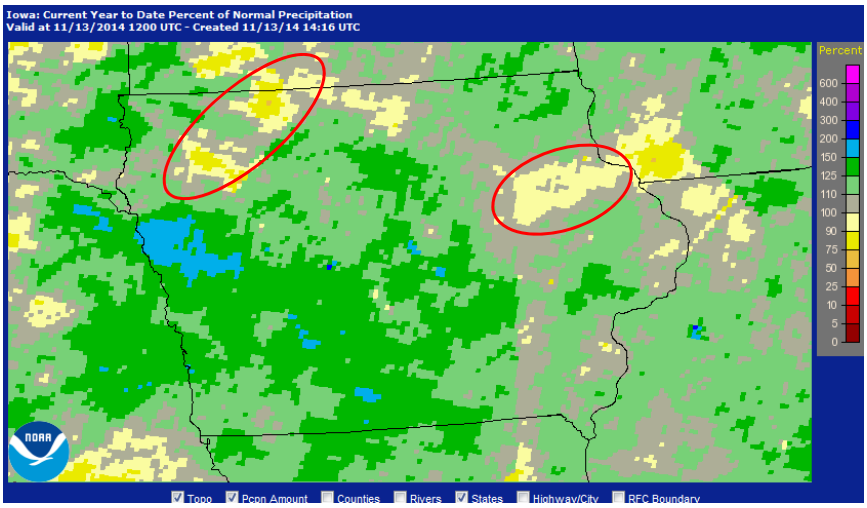
PRECIPITATION

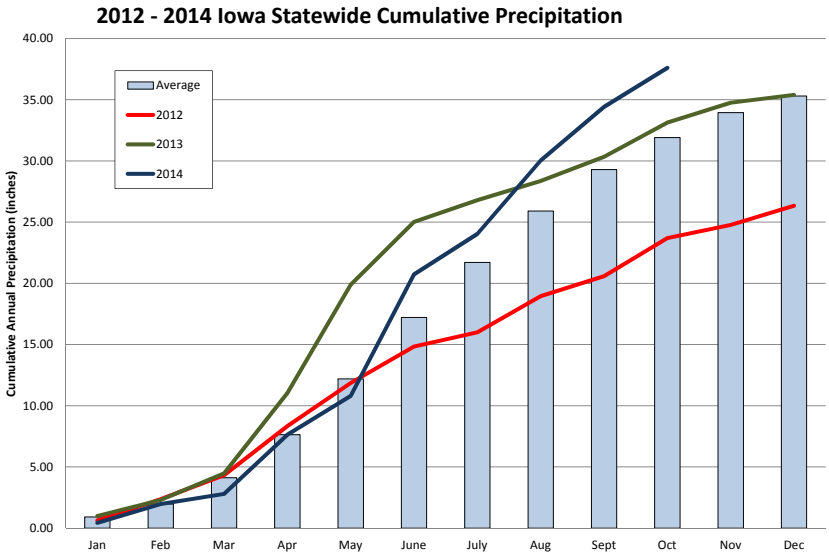
Total Rainfall

Distribution Over Time

Iowa Department of Natural Resources
Chuck Gipp, Director

Total Rainfall – Percent of Normal -Year to Date





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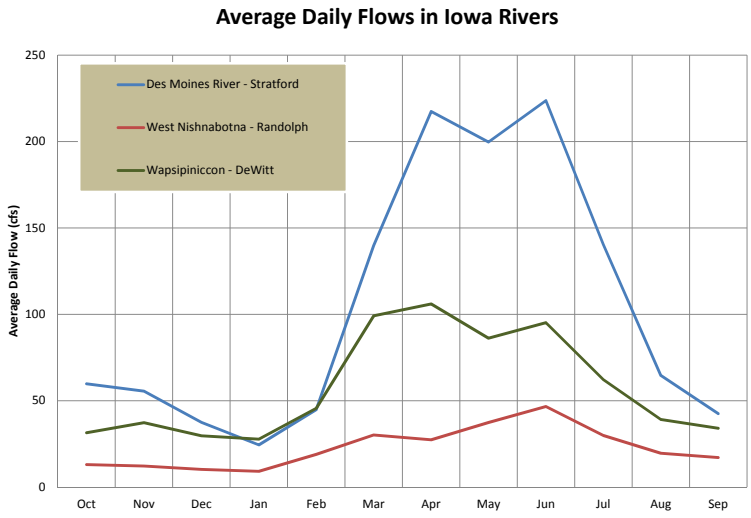
STREAMFLOW

Normal Variation

2014 Conditions

Trends

Normal Annual Streamflow Variation



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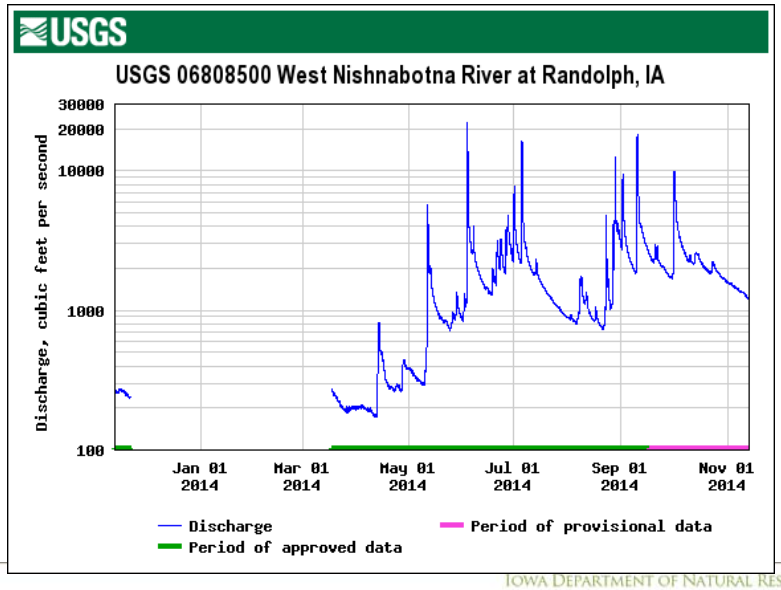
2014 – Western Iowa



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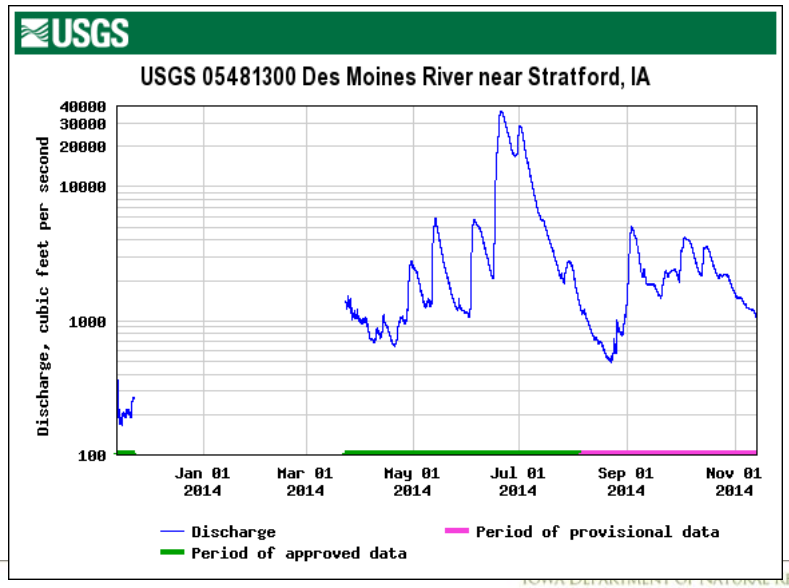
2014 – Central Iowa



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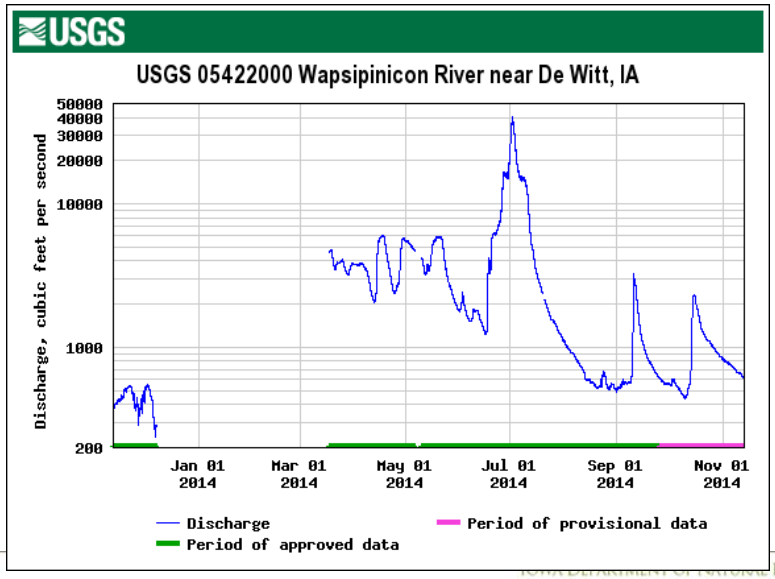
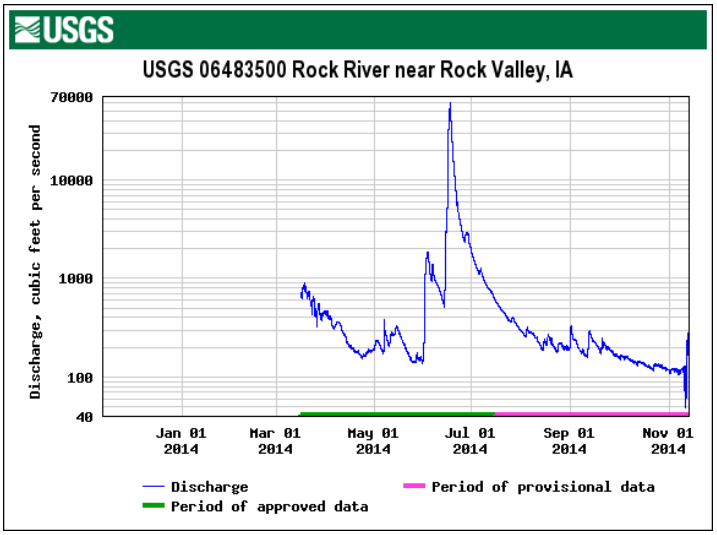
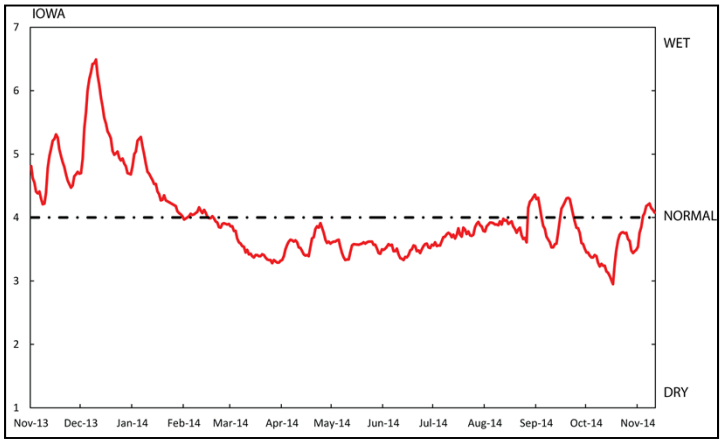
2014 – Eastern Iowa



2014 – Northwest Iowa – Summer Flooding



Streamflow Trends –
USGS Iowa Streamflow Index



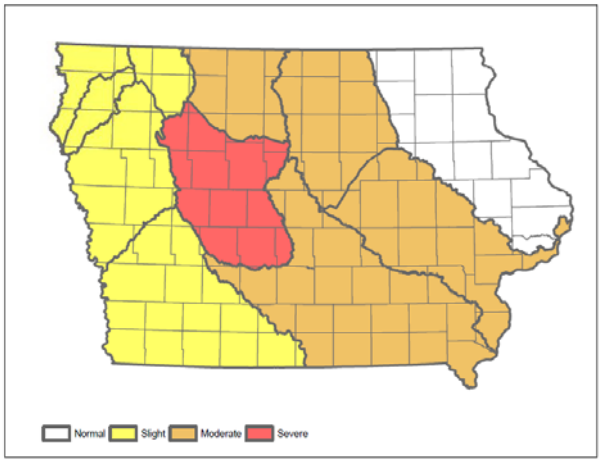
GROUNDWATER

Changes over time

November 2013 to Present

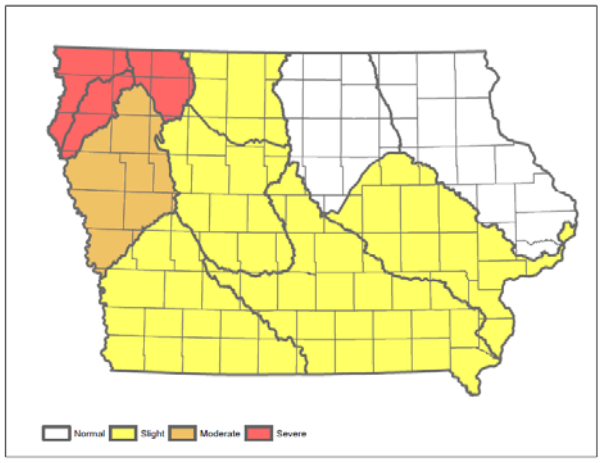
Groundwater in Iowa

November 2013



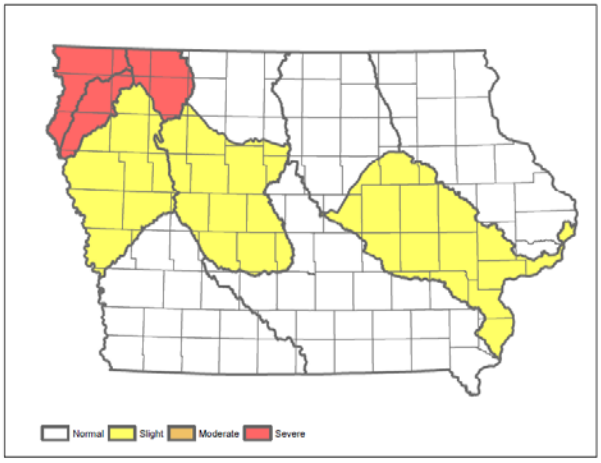
Groundwater in Iowa

May 2014



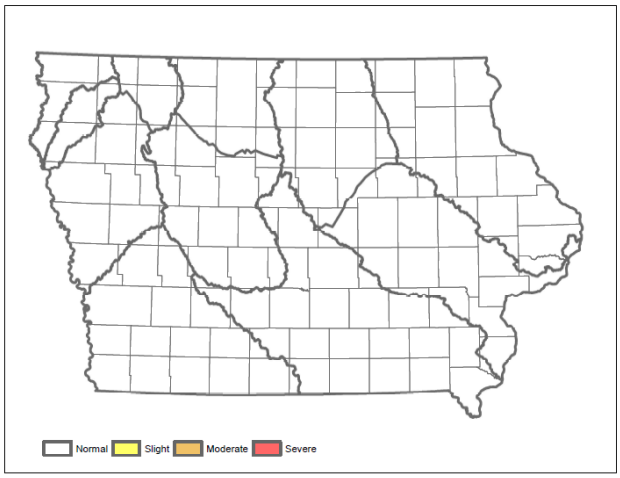
Groundwater in Iowa

June 2014



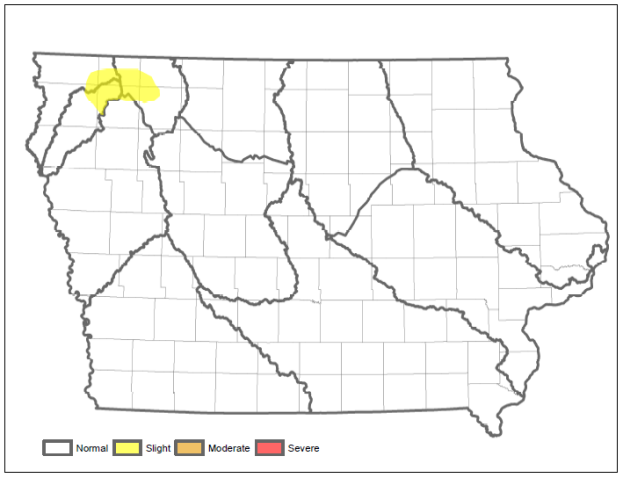
Groundwater in Iowa

July 2014



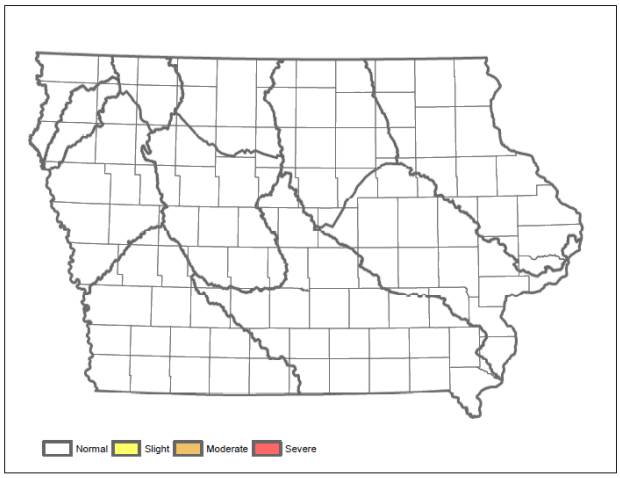
Groundwater in Iowa

September 2014



Groundwater in Iowa

October to Present 2014



One Note

USGS no longer monitors shallow groundwater wells in Iowa – making it more difficult to track regional trends.

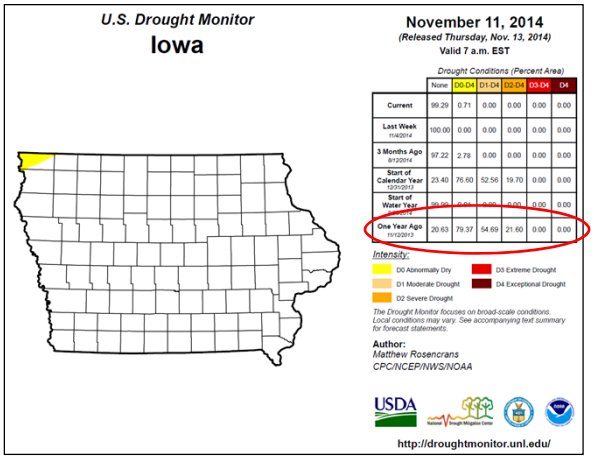
National Drought Monitor

November 2013 to Present

Current Regional (Minnesota) Developments

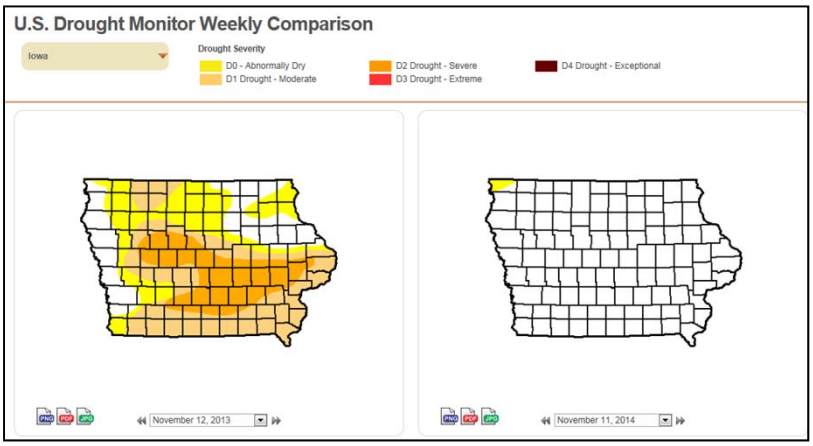
Iowa Department of Natural Resources
Chuck Gipp, Director

Current National Drought Monitor for Iowa

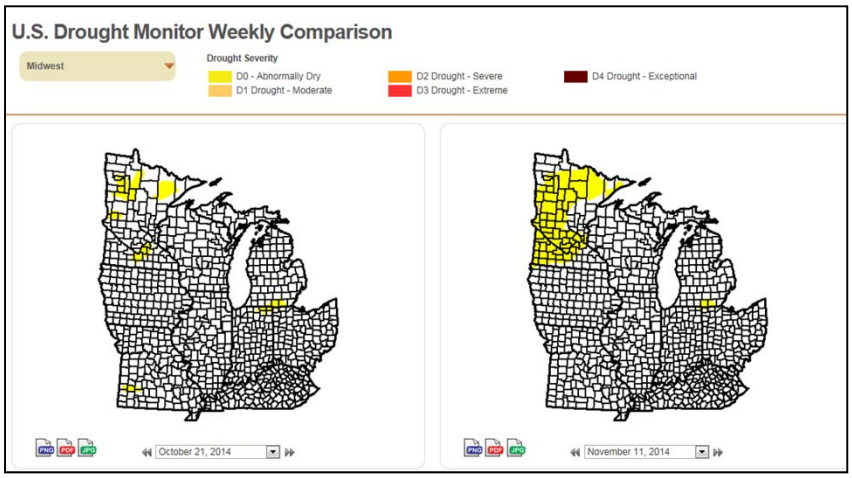


	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	99.29	0.71	0.00	0.00	0.00	0.00
Last Week 11/4/2014	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago 8/12/2014	97.22	2.78	0.00	0.00	0.00	0.00
Start of Calendar Year 12/31/2013	23.40	76.60	52.56	19.70	0.00	0.00
Start of Water Year 9/30/2014	99.99	0.01	0.00	0.00	0.00	0.00
One Year Ago 11/12/2013	20.63	79.37	54.69	21.60	0.00	0.00

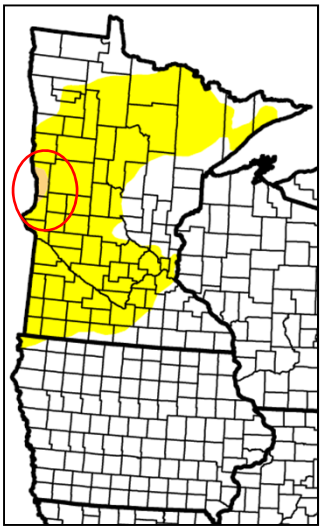
National Drought Monitor for Iowa – November 2013



National Drought Monitor - Midwest Region



National Drought Monitor - Midwest Region



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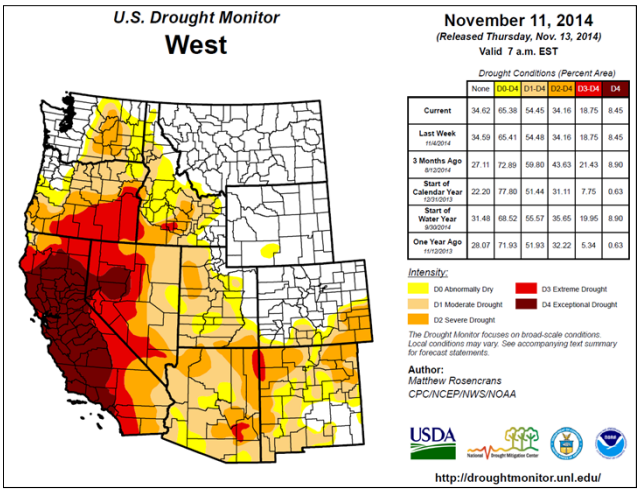
CHUCK GIPP, DIRECTOR

National Drought Monitor
West Region November, 2014



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	34.62	65.38	54.45	34.16	18.75	8.45
Last Week 11/4/2014	34.59	65.41	54.48	34.16	18.75	8.45
3 Months Ago 8/12/2014	27.11	72.89	59.80	43.63	21.43	8.90
Start of Calendar Year 12/31/2013	22.20	77.80	51.44	31.11	7.75	0.63
Start of Water Year 9/30/2014	31.48	68.52	55.57	35.65	19.95	8.90
One Year Ago 11/12/2013	28.07	71.93	51.93	32.22	5.34	0.63

Conclusions:

1. **2014 has been a hydrologically good year in Iowa.**
2. **Precipitation and streamflow have generally been at or above normal.**
3. **Groundwater has recovered in nearly all of the State – although there are areas of NW Iowa that bear watching.**
4. **Drought is gone from Iowa, but is conditions are dry just to the north in Minnesota.**

For more information contact Tim Hall, Hydrology Resources Coordinator, Iowa DNR. 515-249-0116 tim.hall@dnr.iowa.gov

IOWA DEPARTMENT OF NATURAL RESOURCES
CHUCK GIPP, DIRECTOR

NEWS RELEASE

Contact: MRRIC at info@MRRIC.org

November 7, 2014

COMMITTEE MAKES PROGRESS ON MISSOURI RIVER MANAGEMENT PLAN

Omaha, Neb. - The Missouri River Recovery Implementation Committee (MRRIC) met in La Vista, Neb. November 4–6. At this, its 27th meeting, the Committee had extensive discussions with the U.S. Fish and Wildlife Service and an Independent Science Advisory Panel (ISAP) regarding population targets for the three listed species on the Missouri River, the least tern, piping plover and pallid sturgeon. These targets will be used in deciding upon management strategies to be employed, and are critical for measuring the overall success of the Missouri River Recovery Management Plan. The Committee also discussed how metrics used as proxies for a variety of river uses will assist in evaluating these strategies.

The Committee deliberations were informed by a team of scientists working on the life history of the three listed species and developing models that will predict the response of the species to various changes in water management and habitat development. These models are being reviewed by the ISAP to assure technical accuracy. The models will help inform development of alternative recovery actions for the Corps' Missouri River Recovery Program (MRRP) Management Plan and Environmental Impact Statement.

The Committee recommended maintaining Dr. Michael Mac as the Chair, serving his third term, and appointed Jim Becic of Omaha, Neb. as the Vice-Chair for calendar year 2015.

MRRIC is a 70-member committee that comprises stakeholders and representatives of Tribal, state and federal governments throughout the Missouri River Basin. This Committee provides recommendations to federal agencies on the current and future activities of the MRRP. The Committee makes its substantive recommendations by consensus.

The Committee meets quarterly at different locations throughout the Missouri River basin. The next MRRIC meeting will be February 24-26th in the greater Kansas City area. For more information on MRRIC, please contact Dr. Michael Mac, Committee Chair, at info@mrric.org Additional links related to the Missouri River recovery efforts are: www.mrric.org and www.moriverrecovery.org

About MRRIC

MRRIC was authorized by Congress in the 2007 Water Resources Development Act and was established in 2008 by the Assistant Secretary of the Army (Civil Works). Its duties include providing recommendations to the Secretary of the Army and other Federal agencies, State, and Tribal governments on efforts to recover Endangered Species Act (ESA)-listed species, mitigate habitat loss, and restore the ecosystem to protect other native species. MRRIC is supported by the U.S. Institute for Environmental Conflict Resolution and RESOLVE, an independent dispute resolution non-profit organization, and Federal agency staff.

Additional notes from Shawn:

The development of the Effects Analysis (determination of the effect that river management and conditions have on the tern, plover and sturgeon) is well under way.

For the birds, it appears to be mainly availability of emergent sandbar habitat (for nesting and rearing) that affects population. Most of this emergent sandbar habitat is around the shores of the reservoirs and in the river just below the dams. Little of this is in the river reach along Iowa. Modeling of river management effects on emergent sandbar habitat is ready to begin.

For the pallid sturgeon, current research has not clearly identified the limiting factors. Indications and professional judgment point toward limits on habitat and food for free floating larvae after spawning and egg hatch. They need 10-14 days of development time and then a suitable place for larvae to settle and feed. Constructed shallow water habitat is intended to provide places for them to slow down, settle and feed. We have and are building more of this kind of habitat along river bends bordering Iowa. The exact design and construction parameters are a discussion point as are potential impacts on river flow, water quality, and surrounding land use. This field continues to evolve and more research about the effects on sturgeon life cycle is ongoing and still needed. River management plan development will likely be delayed to allow more research in this area.

In lieu of immediately developing complex modeling factors to estimate the effect of river management actions on other uses of the river (labeled as human considerations), we have attempted to develop more simple proxy measures to estimate these effect relationships to do initial screening of the effects of management alternatives. These proxy measures are nearly ready to insert into models for testing under some initial river flow parameters. The results of this proxy modeling will help direct us to alternatives that deserve more complex modeling and evaluation.

An adaptive management plan is in early development stages, and will be a primary focus of the agencies and MRRIC for the coming months. This plan will specify how the agencies monitor and learn from the results of management actions going forward and adjust management decisions accordingly.

A lawsuit filed by several landowner interests on the lower river (Ideker Farms vs US) alleges that changes in river management by the Corps of Engineers resulted in flooding of plaintiffs' land and property that constitutes a taking of the land and other property without just compensation. I mention this because the plaintiffs' initial disclosure document listed several members of the MRRIC (including me) as persons who may have information to support their case. Just wanted you to know this in the event that any actions are necessary related to the case.

As always, contact me if you have any input or questions.

Shawn Shouse, sshouse@iastate.edu, 712-769-2650

Missouri River Recovery Management Plan and Environmental Impact Statement

U.S. Army Corps of Engineers | Fact Sheet

What is the Missouri River Recovery Management Plan and Environmental Impact Statement?

The Missouri River Recovery Management Plan and Environmental Impact Statement (EIS) is a three-year effort that will evaluate the effectiveness of current habitat development and recommend any needed modifications to more effectively create habitat and avoid jeopardy to the species. The plan will:

- Include an adaptive management plan for all Missouri River Recovery Program actions to ensure management decisions and actions are continuously improved by the learning that takes place from regular monitoring of the river;
- Incorporate actions proposed by the Missouri River Recovery Implementation Committee, an advisory body that provides recommendations and guidance to the Corps; and
- Comply with the National Environmental Policy Act and other statutory mandates, regulatory requirements and authorizations.

What is the Missouri River Recovery Program?

This effort is led by the Kansas City and Omaha Districts of the Corps.

The Missouri River Recovery Program is an effort on the Missouri River to replace lost habitat and avoid a finding of jeopardy to threatened and endangered species (pallid sturgeon, least tern and piping plover) resulting from Corps projects.

- This program includes propagation and development of emergent sand bar habitat, shallow water habitat and wetland and terrestrial habitat. It also includes ongoing data collection and monitoring to determine if these actions are effective.
- These actions are requirements outlined by the:
    - Various Water Resources Development Acts that authorize the Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Project; and
    - 2000 Biological Opinion, amended in 2003 (collectively referred to here as the BiOp), issued by the U.S. Fish and Wildlife Service. See sidebar for more details.

Why is it important to comply with the National Environmental Policy Act?

The Council on Environmental Quality describes the National Environmental Policy Act as our Nation's charter for protection of the environment. For major federal actions significantly affecting the quality of the human environment, an agency is required to prepare a document describing the environmental impact of the proposed action, any adverse environmental effects, alternatives to the proposed action, a description of the relationship between the short-term uses of the human environment and long-term productivity, and any irreversible and irretrievable commitment of resources caused by the action.

What is a Biological Opinion?

The Corps is required by federal law to consult with the U.S. Fish and Wildlife Service (Service) to determine the potential effects of proposed actions on threatened or endangered species. These consultations can result in a biological opinion (BiOp) issued by the Service.

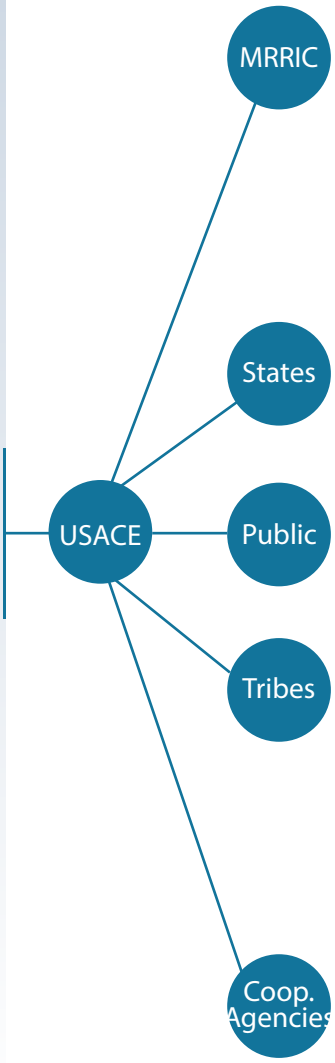
In 2000, the Service issued a BiOp (later amended in 2003) that found that actions proposed by the Corps would jeopardize the continued existence of three federally listed species, the piping plover, least tern and pallid sturgeon. The BiOp recommended recovery actions that are carried out by the Missouri River Recovery Program, such as creating sandbar habitat and shallow water habitat, as well as propagation efforts.

How the Corps will coordinate throughout the Management Plan and EIS process

Coordination

The U.S. Army Corps of Engineers (Corps) plans to coordinate with the public, other federal agencies, states and Tribes throughout the Management Plan and EIS process:

Scoping
Public Outreach
Draft EIS review
Final EIS available
Tribal outreach



The Corps will collaborate with the Missouri River Recovery Implementation Committee (MRRIC), which represents a cross-section of basin interests, including federal and state agencies, Tribes, industry and other interests. Collaboration with MRRIC will allow for substantive input on key activities and products in a tight project timeline.

The U.S. Fish and Wildlife Service will support the Corps by engaging state fish and wildlife agencies in the Management Plan and EIS consistent with the Fish and Wildlife Coordination Act. State agencies are encouraged to take full advantage of this opportunity.

The Corps will provide opportunities to hear information about plan development and the science used to inform decision making. Initial public comments were collected in September 2013. Additional public scoping will be offered following the selection of a draft plan.

The Corps will engage with Tribes pursuant to Tribal Trust responsibilities, including government to government consultation as requested by Tribes.

Cooperating agencies have jurisdiction by law or special expertise with respect to any environmental impact involved in the federal action.

Details of the Management Plan and EIS

1. The goal is to develop an Adaptive Management Plan and to assess effectiveness of Corps actions being taken pursuant to the 2003 Amended Biological Opinion.
2. The geographic scope is limited to the Missouri River mainstem from Fort Peck Reservoir to the confluence of the Mississippi River and the Yellowstone River from Intake Dam at Intake, Montana, to the confluence with the Missouri River.
3. The scope does not include ecosystem restoration or work in the tributaries.
4. The plan will provide the Corps' Missouri River Recovery Program with National Environmental Policy Act coverage through the completion of an Environmental Impact Statement.
5. The effort will be completed by Spring 2016.
6. Due to the expedited timeline, focused engagement will be implemented with MRRIC, the public and other agencies.

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U.S. Senator Mike Johanns for the State of Nebraska

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September 29, 2014

Johanns, Fischer Press for Answers on Federal Land Acquisitions and Habitat Construction

WASHINGTON — U.S. Sens. Mike Johanns (R-Neb.) and Deb Fischer (R-Neb.), member of the Environment and Public Works Committee, today wrote to the Army Corps of Engineers and Fish and Wildlife Service pressing for answers about private land acquisitions and habitat construction along the Missouri River in Northeast Nebraska. The letter questions the federal government's strategy to preserve fish and wildlife along the river in light of a scientific report suggesting that the habitat construction projects are not effective and concerns raised by citizens about the projects' impacts to private property. Taxpayers have already spent millions of dollars on these projects, and the Army Corps is planning to spend millions more, with little or no evidence of effectiveness.

"We do not believe that the costs and scale of federal acquisitions along the Missouri River can be justified when the scientific evidence of their efficacy in preserving these species seems to be hypothetical," the Senators wrote. "We urge you to cease burning through taxpayer dollars acquiring land and constructing habitat until evidence demonstrates that these projects are actually effective in species restoration."

The full text of the letter is available below:

Dear Director Ashe and Lieutenant General Bostick:

We write to express concern about actions taken in the name of enforcing the Endangered Species Act that have impacted the livelihoods and security of Nebraskans living along the banks of the Missouri River.

As you are aware, the Biological Opinion issued by Fish and Wildlife Service (FWS) in 2000 and amended in 2003 found the operation of the Missouri River Main Stem Reservoir System by the U.S. Army Corps of Engineers jeopardized the endangered pallid sturgeon, least tern, and piping plover and offered alternative measures to protect the species. One of the alternatives identified by FWS was habitat restoration, creation, and acquisition.

This alternative requires the creation of 20-30 acres per mile of shallow water habitat and 80 acres per mile of emergent sandbar habitat. Thousands of acres of habitat have already been constructed. Some of it was damaged in the 2011 flood and now has to be reconstructed. Many more millions of dollars remain to be spent on these projects to bring the river into compliance with FWS's Biological Opinion, and the Corps appears to be forging ahead.

However, while the Corps proceeds with habitat construction, our understanding of the effectiveness of these projects has also progressed. Specifically, the Missouri River Recovery Implementation Committee commissioned a report by its Independent Science Advisory Panel to assess the effectiveness of these measures. This panel of scientific experts cast doubt on the hypothesis of the plan—that these habitat measures would reverse decline of sturgeon, tern, and plover caused by the Bank Stabilization and Navigation Act—as demonstrated in this excerpt:

"From current information it is unclear whether or how habitat construction can contribute to the recovery of pallid sturgeon. Recovery of pallid sturgeon in the Missouri River ultimately may be independent of habitat construction efforts, and may instead depend on successful recruitment below the Missouri and Mississippi rivers confluence, but this is an area of substantial uncertainty. Enhanced population numbers of piping plovers and least terns that may derive from habitat restoration and construction efforts below Gavins Point Dam have unknown implications for the status, trends, and recovery of piping plover across its broader range in the northern Great Plains, or least tern across the interior of North America."[1]

To summarize, the projects may not be contributing to species recovery. And if that is the case, why is the Corps forging ahead with land purchases and habitat construction? Has empirical research been conducted since this report was published that demonstrates the positive impact of habitat construction on species recovery?

We do not believe that the costs and scale of federal acquisitions along the Missouri River can be justified when the scientific evidence of their efficacy in preserving these species seems to be hypothetical. We urge you to cease burning through taxpayer dollars acquiring land and constructing habitat until evidence demonstrates that these projects are actually effective in species restoration. Indeed, even then it is doubtful that the benefit of recovering plover, tern, and sturgeon populations outweighs the very real human and economic costs of returning the river to its original hydrological patterns.

The Water Resources Reform and Development Act of 2014 Section 4003(e) requires a report to Congress accompanying the budget describing activities related to the mitigation of fish and wildlife losses. We request that this report include a description of the specific benefits expected from each proposed shallow water habitat construction project for which funds are requested and an analysis of changes in flood risks that result from habitat construction, including through notching, chutes, and any other features that may increase this risk.

In the meantime, we respectfully request a response detailing current evidence of the effectiveness of these projects. In the alternative, absent such evidence, we would appreciate a response by November 1, 2014, to our request that you cease land acquisitions and habitat construction along the Missouri River in Nebraska. Residents of Nebraska's river communities deserve to know the impacts of these projects.

Sincerely,

Mike Johanns

United States Senator

Deb Fischer

TO: Management Plan and Effects Analysis Teams, MRRIC SPA Task Group

FROM: Independent Science Advisory Panel (ISAP)

RE: ISAP evaluation of EA2b – *Hypotheses for emergent sandbar habitat, piping plovers, and least terns* and *Development of Working Hypotheses Linking Management of the Missouri River to Pallid Sturgeon Population Dynamics* – Final

DATE: July 24, 2014

Introduction

The effects analysis teams, guided by Conceptual Ecological Models (CEMs) for plovers, terns, and pallid sturgeon, developed corresponding sets of hypotheses concerning potential management actions directed towards achieving previously stated species objectives. The hypotheses will focus continued development, application, and evaluation of operational models used to project the implications of alternative management actions on the anticipated outcomes for plovers, terns, and pallid sturgeon. Hypotheses link the conceptual ecological models, through relevant available data and analyses, to model outputs, which in turn are used to identify a suite of potential management actions and their likelihood of meeting MRRMP goals.

For purposes of this review, the ISAP understands that the EA teams are formulating "hypotheses" primarily as qualitative statements that describe the effects of potential management actions on the population dynamics of the three species and their supporting habitats. These hypotheses will be evaluated using operational models developed from the corresponding CEMs. The hypotheses presented reflect current assumptions about management actions, which when carried out are expected to produce desired responses by the three species and the habitats that support them.

The ISAP recognizes that the Effects Analysis is an iterative process. The specification and prioritization of hypotheses for initial modeling allows the EA teams to focus on a manageable number of hypotheses, at the same time providing opportunity to return to previous steps and address additional hypotheses as necessary. The ISAP is aware of the limited time available to complete the Effects Analysis. The panel attempts here to differentiate review comments into those that should be considered as part of immediate EA activities (in initial modeling), and those that might be completed as part of a longer-term, less time constrained EA process (in an EA Phase 2, see below).

The compressed schedule introduces potential uncertainties, and elevates the risk that management actions identified in the EA process will be less effective than anticipated and must be adjusted as lessons are learned during their implementation in an adaptive management framework.

The ISAP considers below each of the review questions, then summarizes with conclusions and implications, and closes with recommendations for the near term (Phase 1) and longer term (Phase 2) continuation of the Effects Analysis.

Review Questions

1. **Are there important relationships likely to affect survival of the species that are not captured in one or more of the hypotheses? In other words, are there any hypotheses that were missed?**

The hypotheses developed for terns and plovers and their habitats appear to be comprehensive and consistent with the CEMs for the species. Habitat-related hypotheses include regulation of water levels and flows, and sediment transport and emergent sand bar configuration, as they relate to nesting and foraging habitat and population dynamics. Species-related hypotheses address nesting habitat, food availability, predation, immigration, human interference (including effects from pets and livestock), and overwintering survival. It is not apparent that other important hypotheses have been overlooked for terns and plovers. The hypotheses for terns and plovers are sufficiently narrowly defined that categorized subsets of hypotheses were unnecessary and all the hypotheses will be addressed in near-term modeling activities.

The lists of global and dominant hypotheses for pallid sturgeon also appear comprehensive and consistent with the CEMs. The limited understanding of population dynamics of pallid sturgeon forces a need to distill a large number of hypotheses into a more narrow set around which management actions can be crafted, and to identify priority hypotheses for immediate use in identifying and evaluating potential management actions. Accordingly the pallid sturgeon report distinguishes between Phase 1 hypotheses, which will be addressed in the near term to support the Management Plan and Phase 2 hypotheses, which can serve to broaden the set of management actions available and refine the management actions implemented during adaptive management. A primary implication of this approach to the pallid sturgeon EA (setting certain hypotheses into a reserve category to be potentially re-examined during Phase 2) is that the emerging Management Plan will need to be accompanied with a transparent, clearly articulated process for revisiting hypotheses that are currently not addressed in Phase 1.

It is not clear in the draft sturgeon report whether any of several hypotheses were fully considered in developing the global hypotheses for pallid sturgeon. Within the standing set of dominant hypotheses for pallid sturgeon, none addresses the potential importance of possible diseases (e.g., iridovirus), known to be of concern in hatchery conditions, but only of speculated importance among wild fish. Parasites are also not mentioned. Agrochemicals are considered as candidate working management hypotheses (Tables 4 and 5), but we were unable to locate a relevant underlying dominant hypothesis for it in previous Tables. Persistent pollutants (e.g., PCBs, atrazine, selenium, mercury) and novel chemicals (e.g., pharmaceuticals) from municipal point sources are not specifically identified as hypotheses that should be addressed in relation to early life stage survival.[1]

[1] There is an inconsistency in labeling and numbering hypotheses among the categories making the resulting hierarchy difficult to understand. The major contaminant hypothesis is – regulation of agricultural runoff and

Another hypothesis to potentially consider is related to the fact that reproductively mature, wild pallid sturgeon are reported to be rare in the Missouri River, particularly above Lake Sakakawea (U.S. Fish & Wildlife Service 2013). Is it possible that there are insufficient numbers of mature, wild male or female adults for functional spawning aggregations to develop and successful spawning (i.e., egg fertilization) to occur at a magnitude that will maintain a viable genetically wild component in the population?

Additionally, pallid sturgeon historically used the lower reaches of some of the larger tributaries of the Missouri, Yellowstone and Mississippi rivers. More recent observations indicate that Missouri River tributaries may be more important than originally recognized when the species was listed and may be beneficial to the pallid sturgeon during certain times of the year or perhaps during certain life stages (U.S. Fish and Wildlife Service 2013). The Service listed 8 tributaries where hatchery-reared pallid sturgeon have been collected and Delonay et al. (2014) report that pallid sturgeon are suspected to have spawned in the Platte River. The EA team might reference evidence of the contributions of major tributaries to the Missouri River system to pallid sturgeon recruitment.

Subsequent to our EA2b draft report the ISAP has discussed questions above with the sturgeon EA team lead. The ISAP understands that additions/clarifications will be made to the sturgeon report regarding hypotheses that were considered, and that hypotheses not initially modeled may be revisited later as needed.

2. **Are there important hypotheses, significant to species recovery, not included in the initially modeled category (i.e., hypotheses currently in the 'reserve') that should be modeled now?**

As previously indicated, the habitat and species hypotheses for terns and plovers are sufficiently few that all the presented hypotheses have been identified for inclusion in the initial modeling activities underway in support of the Effects Analysis. And, in contrast, the large number of hypotheses developed for pallid sturgeon required categorization and prioritization to identify a smaller number of hypotheses that could be realistically addressed in the near term. The ISAP does not have sufficient knowledge to recommend specific hypotheses currently in the reserve hypothesis list that should be addressed in the initial modeling efforts.

While the ISAP recognizes the need to distill the hypotheses down to a tractable subset, the categorization process and its final results for pallid sturgeon raise some concerns. The final assignment of pallid hypotheses to the reserve category based on agency responsibility and authority is understandable from the perspective of policy. However, if factors important to the

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municipal waste discharge will decrease exposure to endocrine-disrupting chemicals, thereby decreasing the incidence of intersex individuals and increasing reproductive success of adults. That hypothesis is variously labeled # 43 or 44. It is ranked high with low uncertainty in Fig. 5 (#44, pg. 26); however, a precursor to it does not appear in Table 2 or 3 (Candidate working dominant hypotheses). Then it shows up in Table 4 (Candidate working management hypotheses before third survey – #43, pg. 38) and Table 5. Then it is dropped.

overall population dynamics of pallid sturgeon in the Missouri River system are omitted from the near term (or overall) modeling effort as a result of this categorization, the resulting Effects Analysis could inaccurately characterize the effectiveness of modeled management actions in achieving species objectives. For example, the expert elicitation process identified toxic chemicals as a potentially important component of early life stage pallid mortality. The ISAP understands that the agencies are not responsible for or authorized to address these kinds of contaminant issues. But, if the potential impacts of these chemicals are not included in the initial modeling effort, and if they are in fact key factors in determining early life stage survival, the model results will be incorrect, even if the included modeled components of mortality (including predation, flows, sedimentation, and natural baseline mortality) are accurately represented.

Other hypotheses for pallid sturgeon that are presently assigned to the reserve may subsequently need to be incorporated into the initial modeling and Effects Analysis as more information is obtained about them, or as other hypotheses are determined not to be effective at achieving species objectives. A complete and most useful Effects Analysis ultimately would address all (important) factors affecting species survival, and is needed to specify a suite of actions likely to achieve species objectives, independent of agency responsibility or authority.

The ISAP understands that the limited data on and understanding of environmental factor effects on pallid sturgeon constrains the derivation of accurate and defensible stressor-response functions for toxic chemicals and other stressors implicit in other hypotheses now in reserve. Nevertheless, it should be possible to describe plausible stressor-pallid sturgeon response relationships to include in the initial modeling efforts, and to perform scenario-consequence analyses or sensitivity analyses by systematically varying the corresponding parameter values to characterize the potential importance of these currently omitted stressors (e.g., disease, parasites) on survival at relevant life stages and overall population dynamics of pallid sturgeon in the Missouri River system. Such analyses might be deferred to Phase 2 given constraints in time and resources, but the Effects Analysis will provide more accurate management guidance if such exploratory modeling activities are included in Phase 1.

3. **Are the hypotheses (global, working dominant, working management, and initially modeled) logical and appropriate given our understanding of the science and of the institutional context (e.g., schedule, MRRP, uncertainty about the scientific information, and the need to move forward) in which we are working?**

The hypotheses are generally logical and appropriate, consistent with available science, and workable within the institutional context of management planning for the Missouri River. The report for plovers and terns clearly illustrates the relationship between proposed hypotheses and the corresponding CEMs. Relevant pathways in the CEMs are highlighted for each hypothesis. The relative importance of each hypothesis and associated uncertainties in relation to the species objectives appear to well reflect the state of the science for these two species.

Similarly, the CEMs developed for both the population-level and life-stage components of pallid sturgeon were used to guide the development of hypotheses for the Effects Analysis. The hypotheses appear consistent with current understanding of pallid sturgeon population dynamics

within the Missouri River system. However, there is considerable uncertainty associated with this understanding, including knowledge gaps relevant to the survival of the pallid sturgeon's early life stages. The approach for arriving at initially modeled hypotheses for pallid sturgeon by working from the "Multiple Management Hypotheses" from the left side of Figure 3, combined with the "Dominant Biological Hypotheses" from the right side of the figure, was a creative way to rapidly and meaningfully reduce the number of potential hypotheses to be addressed in the Phase 1 Effects Analysis. Continued analysis of existing MRRP project data, synthesis of information on similar species in other, similar systems, and exploratory modeling might help to improve the overall understanding of sturgeon population dynamics and help refine the pallid hypotheses.

Because of the time constraints imposed on the EA process, the pallid sturgeon EA team chose to categorize the "global" hypotheses using expert opinion into "working dominant" hypotheses and "working management" hypotheses, and then by imposing agency sideboards to produce a narrow set of "initially modelled" hypotheses. Numerous hypotheses were conveyed into a set of hypotheses in reserve. The process used by the EA team to filter hypotheses seems to produce reasonable results with regards to identifying the set of sturgeon management actions that will be initially evaluated in the EA process. As mentioned above in Q2 and below in Q4, the ISAP has concerns about hypotheses put in reserve because of agency sideboards.

Nonetheless, there are two aspects of that filtering process that are poorly defined and need further explanation and documentation. First, it is not clear how hypotheses that are filtered out - not ending up in the "initially modeled" hypothesis set and instead in the reserve set - might later be reconsidered as part of the Management Plan (should initially selected hypotheses prove to be inadequate to achieve species objectives, or if more detailed examination of empirical evidence supports alternative hypotheses). In reality, the Management Plan will be challenging to modify and likely be only incrementally modified once implementation has begun, and the "initially modelled" hypotheses will likely be the drivers of management actions for at least several years. Substantial resources and time will be expended in support of testing these hypotheses. Given the extremely short time allowed for the EA process, there is the very real possibility that one of the hypotheses set aside in the reserve may prove to be more effective and efficient, or may have stronger empirical support upon further consideration and analysis. Thus, the process that will be used to revisit reserve hypotheses is an essential one, and should be outlined in the documentation of the filtering process and described in detail in the developing Adaptive Management Plan.

Additionally, the selection process for expert panel members should be described more thoroughly; the scoring of hypotheses highly influences the EA process and potentially the subsequent Management Plan. That is, the "dominant working" and "dominant management" hypotheses that are selected for initial inclusion in the modeling will likely lead to specific management actions to be considered for the Management Plan. Considering the relatively large proportion of agency personnel on the expert panel – nearly 30% of participants were from the U.S. Geological Survey, CERC, Columbia, Missouri and 15% were from the U.S. Army Corps of Engineers – the EA team should convey in the document the skill areas and mix of expertise of participants to best convey the breadth of disciplinary representation in the process.

There appeared to be some inconsistency with the final analysis of the results of the Delphi process in selecting sturgeon hypotheses for initial modeling. If the median score was below 4 (neutral) and the variability was high for a proposed management action, the action was placed in reserve. However, if the median score was above 4 and variability was high for a scored hypothesis, it was carried forward for initial modeling. High variability in either case would logically imply that the "real" median score could be less than or greater than 4 – and perhaps both situations should result in placing the hypothesis in reserve. The initial modeling, particularly given constraints in time and resources, might reasonably focus on those proposed management actions with median score >4, and degrees of uncertainty that would not likely shift the score below 4. The document does not mention the use of variability or uncertainty in carrying management actions forward; only the median score is mentioned. However, the figures that summarize the Delphi results show that the number of "no knowledge responses" substantially reduces the number of experts actually evaluating many of the hypotheses. In some cases, the range of scores among the remaining experts spans the possible range of scores. This is not to suggest that the Phase 1 Delphi process be repeated. However, future applications of expert elicitation, for example, to develop management-response functions absent data or models, might be based on a refined Delphi method that addresses the above-mentioned concerns.

The hypotheses selected for initial modeling for the three species appear to reflect currently acceptable approaches and tools available to the Corps and sideboards placed on management actions in terms of types and scale of actions. The EA team recognizes that, given the realities of modifications of the river, it may no longer be effective or efficient to attempt to recreate putative historical conditions, and, instead, is hypothesizing alternative, potentially more ecologically effective strategies that focus on the functional ecological conditions that the target species require. The EA team might directly answer the question – are there tools or techniques that could provide specific physical and biotic conditions that may be beneficial to the targeted species, but are dissimilar from those associated with assumed historical channel morphologies and flows? Is there the opportunity to consider a "designed ecosystem," which prioritizes specific engineered features that are thought to satisfy the ecological needs of terns, plovers, and pallid sturgeon in specific geographic areas without harming other native species?

4. Are there risks to the management plan moving forward based on the initially modeled hypotheses or in the manner in which they have been identified?

If important components of pallid sturgeon population dynamics are implicit in the hypotheses currently placed in reserve, the initial modeling efforts that fail to include those components might incorrectly characterize the effectiveness of alternative management actions evaluated in the Effects Analysis. Management actions that are selected and implemented on the basis of incomplete modeling results might fail to achieve anticipated outcomes; an important consideration for environmental stressors known or strongly suggested to be scientifically important, but assigned to reserve status due to policy decisions.

High uncertainty exists as to the strength of many of the "initially modeled" hypotheses and/or input variables for models designed to evaluate them. Thus there is risk that management actions

selected based on those evaluations will not achieve intended outcomes. This necessitates a precautionary approach to implementing such uncertain management actions.

Field scale prototype management actions might test the robustness of individual hypotheses and differentiate among competing hypotheses with design and implementation at smaller spatial scales (e.g. at habitat-patch scale or by river reach) and shorter temporal scale (1-3 year), in a manner that also would minimize larger-scale or longer-term impacts to stakeholder interests and other biota. Monitoring the success of such smaller-scale actions will inform agencies of their potential effectiveness, and the desirability of scaling-up implementation. This approach is central to Adaptive Management and will require a performance-based monitoring and assessment program.

In absence of a detailed quantitative understanding of early life stage population dynamics for pallid sturgeon in the Missouri River, management of habitat appears to be a preferred approach to achieve programmatic species objectives. For such an approach to be effective, however, pallid sturgeon "habitat" must be operationally defined for the Missouri River in terms of both physical resources and biological resources; combined they provide the environmental elements necessary for pallid sturgeon survival, persistence, and recovery. Channel morphology, fluvial characteristics, and flows regime are key factors in a definition of pallid sturgeon habitat. Other environmental attributes, including chemical and biological drivers that affect pallid sturgeon survival and persistence should be considered in defining the suitability of "habitat" for purposes of the quantitative modeling in support of the Effects Analysis.

The Effects Analysis is fundamentally a scientific investigation. Implementing agencies initiate the Effects Analysis with a needs assessment, establish programmatic goals and objectives, and define the spatial and temporal planning boundaries. The agencies select from alternative management actions that have been evaluated in the Effects Analysis for their capacities to deliver desired species or environmental responses. In between, an expert effects analysis team crafts conceptual ecological models, identifies and synthesizes pertinent scientific information, assesses the need for and efficacy of candidate actions, and constructs and runs quantitative models linking alternative management actions and likely species or environmental responses. To assure that a complete array of management responses (vetted using best available scientific information) is available to the agencies that manage the river and its resources the Effects Analysis must consider all environmental stressors. A truncated list of management hypotheses and candidate management actions increases risk to the potential success of the overall program.

Conclusions

The hypotheses presented for terns and plovers appear to capture the important relationships likely to affect their continued viability within the Missouri River basin. These habitat- and species-focused hypotheses can usefully guide the initial modeling in support of the overall Effects Analysis. Similarly, the "global" hypotheses developed for the pallid sturgeon appear to include the important relationships that are known or suspected to influence the viability of the species in the Missouri River. The ISAP recognizes that there remain important gaps in understanding the early life stages of pallid sturgeon and that the current incomplete

understanding of pallid population dynamics constrains the pallid sturgeon hypothesis sets. The process of categorizing "global" hypotheses into a smaller set for purposes of initial modeling raises concerns that some or even many effective and/or efficient management actions that could benefit pallid sturgeon will not be considered. The use of agency management authority as a decision criterion for identifying Phase 1 initial modeling hypotheses could detract from the quality and usefulness of the overall Effects Analysis, particularly if water-quality related or other environmental stressors now held "in reserve" prove to be important determinants of early life stage survival for pallid sturgeon.

Implications

The ISAP recognizes the time constraints associated with the ongoing Effects Analysis. However, if key hypotheses for pallid sturgeon are mis-prioritized, or prematurely assigned to reserved status based on agency authority, culling of these hypotheses from the initial modeling efforts might lead to erroneous evaluations of the expected efficacy of candidate management actions. Such errors could propagate throughout the management alternatives selection process and result in selection of management actions that will fail to achieve the species or habitat objectives.

Recommendations

The effects analysis teams should continue to make maximum use of available data to the extent possible. They should use the current understanding of the species and the river system to develop predictive models as possible, and use those models to identify priority questions based on the sensitivity of associated model parameters to potential management actions. The Effects Analysis and subsequent Management Plan should make use of focused laboratory/field studies to reduce specific knowledge gaps identified in the previous stages of the Effects Analysis and the modeling that supports it. Given time and resource constraints, the pallid sturgeon team should attempt to include environmental stressors that have been set aside in the reserve hypotheses in the Phase 1 Effects Analysis.

The effects analysis and adaptive management teams should consider small-scale management actions that can increase understanding of actions' efficacy while minimizing risk to stakeholders and other native species. All small-scale management actions need to be considered very carefully given the pallid sturgeon requires large reaches of river to fulfill its life-history requirements. Evaluating hypotheses via management actions can be best accomplished by a sequence of incremental steps as described above. This stands in contrast to implementing large-scale, costly habitat or flow modifications where the acknowledged uncertainty of demonstrable progress on achieving species objectives over the next decade is high.

The ISAP stresses the importance of species- and population-focused fundamental objectives. To the extent possible, the MRRMP should not rely on proxy response variables, such as acres of spawning habitat, in lieu of species performance measures, while acknowledging the uncertainties that plague the current understanding of pallid sturgeon habitat attributes and their

contribution to fitness. As the effects analysis team progresses and as the Management Plan is developed, direct measures of species performance should serve as the principal metrics for assessing success of the Management Plan.

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APPROPRIATION TITLE: Construction, Environment, Fiscal Year 2015

PROJECT: Missouri River Fish and Wildlife Recovery, Iowa, Kansas, Missouri, Montana, Nebraska, North Dakota, South Dakota, and Tributaries (Continuing)

LOCATION: The Missouri River mainstem and its tributaries.

DESCRIPTION: Within the Missouri River basin, activities will assist with recovery and provide protection to species listed under the Endangered Species Act (ESA), and the ecosystems on which they depend, to address the effects of the operation of the Missouri River Mainstem Reservoir System, the Missouri River Bank Stabilization and Navigation Project (BSNP), and the Kansas River Project. Between Sioux City, Iowa and the mouth of the Missouri River, activities will also provide for mitigation of fish and wildlife habitat losses specifically resulting from the construction and operation of the Missouri River BSNP. Only funding of activities to avoid jeopardy is being requested. This program is 100% Federally funded.

AUTHORIZATION: All existing authorized Corps of Engineers projects along the Missouri River and tributaries - including the Water Resources Development Acts (WRDA) of 1986, 1988, 1999, & 2007; National Industrial Recovery Act of 1933; Flood Control Acts of 1938, 1944, 1954; River and Harbor Act of 1945; as amended.

REMAINING BENEFIT - REMAINING COST RATIO: The remaining benefit-cost ratio for this project is not applicable because environmental benefits were not quantified in monetary terms.

TOTAL BENEFIT-COST RATIO: The total benefit-cost ratio for this project is not applicable because environmental benefits were not quantified in monetary terms.

INITIAL BENEFIT-COST RATIO: The benefit-cost ratio for this project is not applicable because environmental benefits were not quantified in monetary terms.

BASIS OF BENEFIT-COST RATIO: The benefit-cost ratio for this project is not applicable because environmental benefits were not quantified in monetary terms.

SUMMARIZED FINANCIAL DATA:			ACCUM PCT OF EST FED COST
Estimated Federal Cost	$3,739,687,000		
Estimated Non-Federal Other Costs	0		
Total Estimated Project Cost	3,739,687,000		
Allocations to 30 September 2011	503,469,000		
Allocation for FY 2012	72,888,000		
Allocation for FY 2013	71,856,000		
Allocation for FY 2014	58,229,000 7/		
Allocations through FY 2014	706,442,000	1/2/3/5/	19%
Estimated Unobligated Carry-In Funds	447,000	4/	
President's Budget for FY 2015	48,771,000		20%
Programmed Balance to Complete after FY2015	2,984,474,000	6/	
Unprogrammed Balance to Complete after FY2015	0		

Status (1 Jan 2014)	PERCENT COMPLETE	PHYSICAL COMPLETION SCHEDULE
Entire Project	17%	TBD

1/ $16,852,000 reprogrammed from the project.
2/ $1,071,000 rescinded from the project.
3/ $350,000 transferred to the Flood Control and Coastal Emergencies account.
4/ Unobligated Carry-in Funding: The actual unobligated balance from FY 2013 into FY 2014 for this project is $447,391. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2015 from prior appropriations for use on this effort is $0. This amount will be used to perform work on the project as follows: N/A
5/ PED costs of $700,000 are included in this amount.
6/ For programmed work only; remaining work is un-programmed pending a decision to construct these features.
7/ Reflects the FY 2014 Omnibus Appropriations Bill. The FY 2014 Budget amount of $70 million included $20 million to award the Yellowstone Intake Diversion Dam construction contract, which could not be awarded in FY 2014. Approximately,$8.229 million worth of work planned for FY 2015 was advanced into FY 2014 in order to expedite planned work on this program.

JUSTIFICATION: Funds for the Missouri River Recovery Program allow the Corps to avoid a jeopardy opinion on compliance with the Biological Opinion (BiOp) and operate the Missouri River projects in conformance with the eight authorized purposes. The Corps complies with the USFWS BiOp for the operation of the Missouri River Main Stem Reservoir System, Missouri River BSNP and the Kansas River Reservoir System (USFWS 2000, amended 2003). Actions with these funds include shallow water habitat construction/development and floodplain connection for the pallid sturgeon, emergent sandbar habitat construction for nesting tern and plover, pallid sturgeon propagation support, population assessments for the three species, an integrated science monitoring and evaluation program to assess success of management actions for the species, and development/implementation of an adaptive management strategy that includes USFWS and stakeholder participation in the Missouri River Recovery Implementation Committee (MRRIC). The program is targeting approximately 120 individual habitat creation sites, creating a riparian corridor over time. Only funding of activities to avoid jeopardy is being requested.

FISCAL YEAR 2014: The total fiscal year 2014 appropriation, including unobligated carry-in, are being used to first address the highest priority efforts to comply with the USFWS BiOp requirements. Design on the fish passage phase of the Lower Yellowstone Intake project will continue in FY 2014. Current estimated execution plan includes effort as follows:

Item	Amount	
Program Management Activities	$ 4,045,000	
Lower Yellowstone Intake Design	800,000	
Endangered Species Science, Monitoring and Evaluation	6,870,000	
MRRIC Coordination	1,814,000	
Programmatic NEPA and Consultation	2,600,000	
Shallow Water Habitat Construction	28,560,000	
Emergent Sandbar Habitat (terns and plovers)	1,600,000	
Real Estate Acquisition	12,387,000	9/
Total	$58,676,000	8/

8/ Includes unobligated carry-in from FY 2013.
9/ A survey of the acres of shallow water habitat that have been created as compared to the target acreage identified in the Biological Opinion is to be completed in FY 2014. If the targets have been met, allocation of the funding for both real estate acquisition and additional habitat construction is subject to change within the overall confines of the program.

FISCAL YEAR 2015: The budget amount plus carry-in funds will be used to first address the highest priority efforts to comply with the USFWS BiOp requirements. Construction on the fish passage phase of the Lower Yellowstone Intake project will begin in FY 2015. Current estimated execution plan includes effort as follows:

Item	Amount	
Program Management Activities	$ 4,224,000	
Initiate construction of Lower Yellowstone Intake	20,000,000	
Endangered Species Science, Monitoring and Evaluation	9,805,000	
MRRIC Coordination	2,909,000	
Programmatic NEPA and Consultation	1,000,000	
Shallow Water Habitat Construction	9,913,000	10/
Emergent Sandbar Habitat (terns and plovers)	920,000	
Total	$48,771,000	

10/ A survey of the acres of shallow water habitat that have been created as compared to the target acreage identified in the Biological Opinion is to be completed in FY 2014. If the targets have been met, allocation of the $9,913,000 is subject to change within the overall confines of the program.

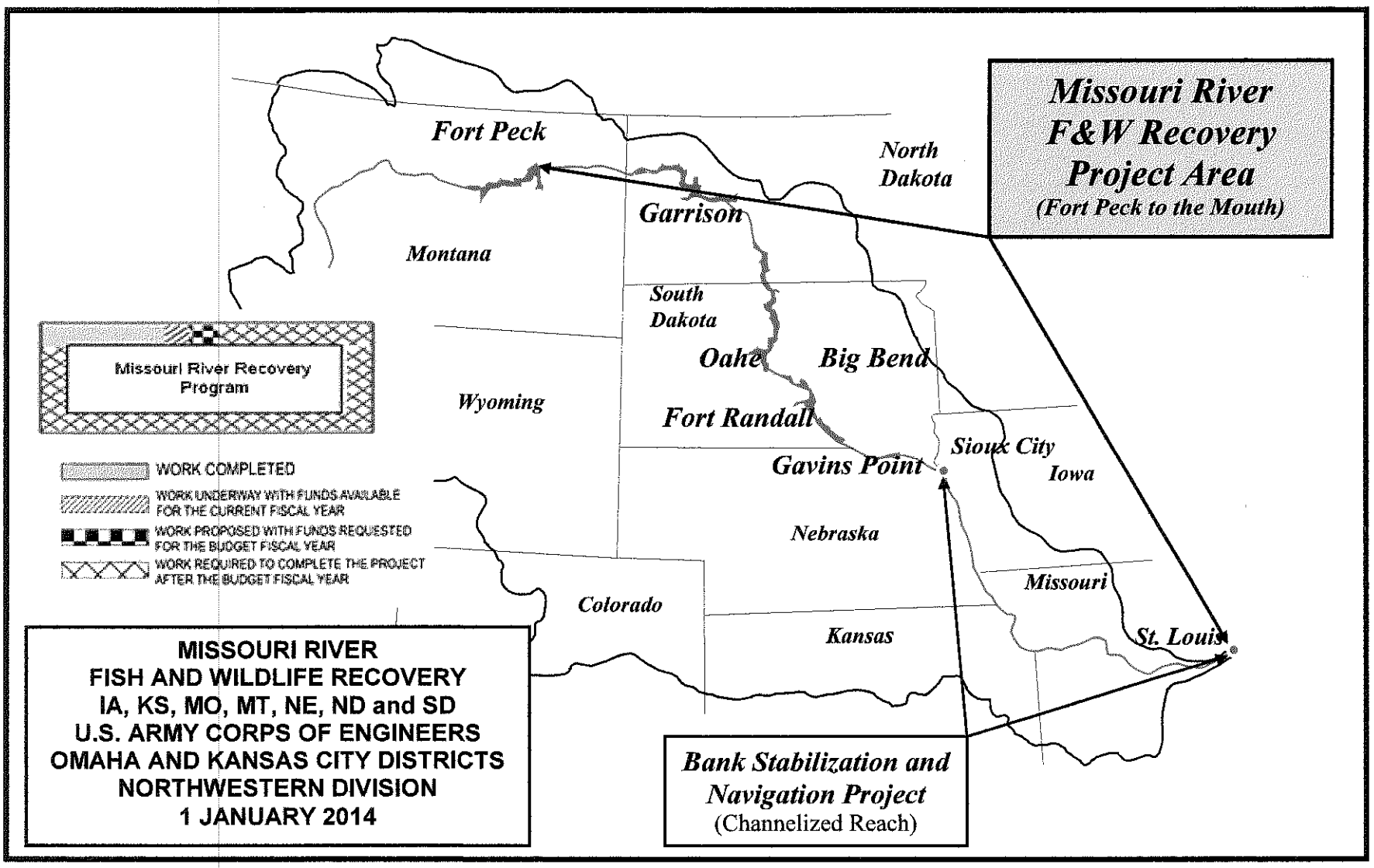
NON-FEDERAL COSTS: Not applicable

STATUS OF LOCAL COOPERATION: Endangered Species Act (ESA) compliance is a Federal responsibility. The 1986 and 1999 authorizing acts for the mitigation below Sioux City provides that the entire cost of the project, including all lands, easements, rights-of-way, and relocations, and all operation and maintenance costs be borne by the Federal Government with no costs to either local or state governments. Therefore, there is no non-Federal sponsor for the project.

COMPARISON OF FEDERAL COST ESTIMATES: The current Federal estimate of $3,739,687,000 is the same as last presented to Congress (FY 2014).

STATUS OF ENVIRONMENTAL IMPACT STATEMENT: The 2003 Amended Biological Opinion was prepared in response to the Corps' proposed revision of the Missouri River Master Water Control Manual as discussed in the supporting National Environmental Policy Act (NEPA) documents. However, the scope of the Amended Biological Opinion is broader than dam operations. Both programmatic and site-specific NEPA documents are being prepared to fulfill NEPA responsibilities for compliance with the 2003 Amended Biological Opinion. The Missouri River Mitigation Project Final Environmental Impact Statement (EIS) was filed with the U.S. Environmental Protection Agency on 23 December 1982. A supplement to the EIS was completed to allow acquisition and habitat development on the 118,650 acres authorized in WRDA 1999. The Record of Decision was signed 12 June 2003.

OTHER INFORMATION: Funds to initiate pre-construction engineering and design of the BSNP mitigation project were appropriated in FY 1990. Initial construction funds for the BSNP mitigation project were appropriated in FY 1992. Funding for the combined ESA and mitigation efforts, now known as Missouri River Fish and Wildlife Recovery, were first appropriated in FY 2005.



Division: Northwestern

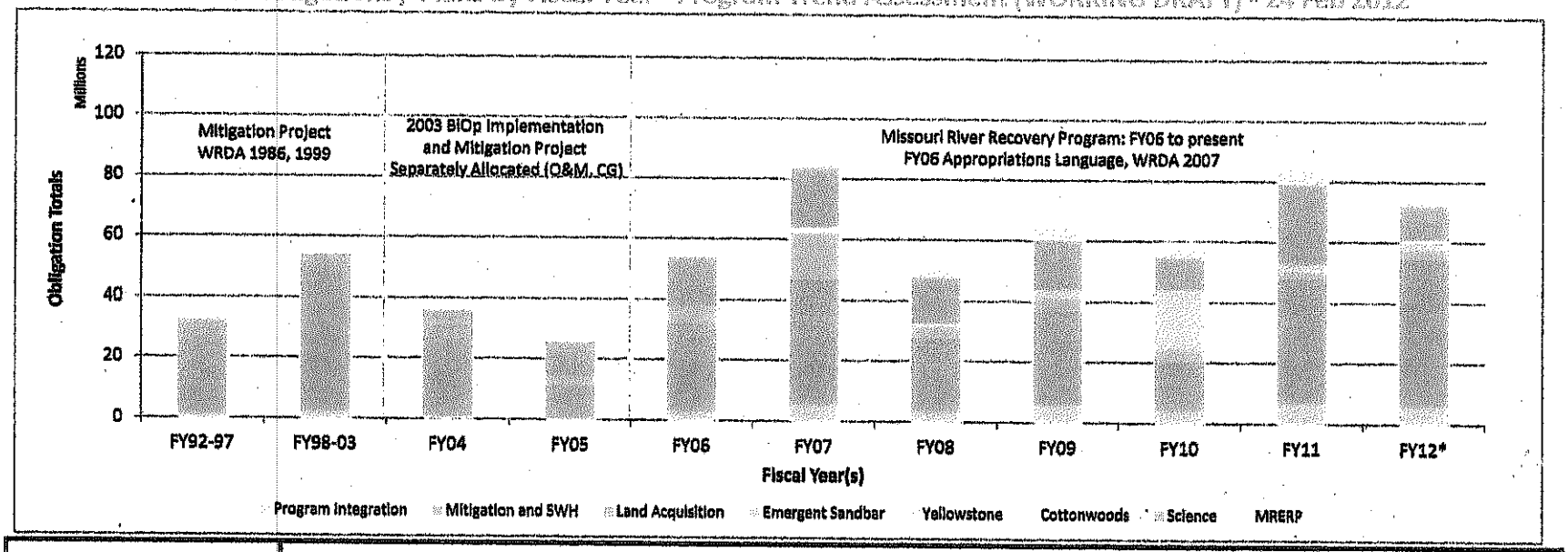
District: Omaha/Kansas City

Missouri River Fish and Wildlife Recovery,
IA, KS, MO, MT, NE, ND, SD, and Tributaries

28 March 2014

NWD-9

MRRP Obligations / Plans by Fiscal Year - Program Trend Assessment (WORKING DRAFT) - 24 Feb 2012



	Thousand $$										
	FY92-97	FY98-03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12*
Program Integration	1,232	2,490	1,159	278	3,115	5,788	3,514	6,131	4,495	7,307	6,144
Mitigation and SWH	10,455	37,130	25,096	10,003	21,014	22,855	13,610	16,506	2,652	26,407	30,895
Land Acquisition	20,588	14,274	4,878	817	8,076	18,126	10,391	14,121	13,185	14,164	17,500
Emergent Sandbar	0	0	859	3,251	5,513	15,448	4,182	4,710	4,448	2,180	3,020
Yellowstone	0	0	0	0	0	0	368	2,380	19,564	2,899	2,500
Cottonwoods					249	1,751	331	140	80	0	741
Science	0	160	3,918	11,295	15,928	19,668	15,255	16,164	10,265	26,107	11,288
MRERP	0	0	0	0	0	1,174	2,644	4,247	2,541	5,662	800
MRRP TOTAL Obligations	**32,275**	**54,054**	**35,910**	**25,644**	**53,895**	**84,810**	**50,295**	**64,399**	**57,230**	**84,726**	**72,888**
CG $$ Obligated	32,275	53,054	13,297	18,893	53,895	84,810	50,295	57,499	56,333	84,551	72,888
ARRA $$ Obligated	0	0	0	0	0	0	0	6,900	897	175	
O&M $$ Obligated	0	1,000	22,613	6,751	0	0	0	0	0	0	

All $$ in actual Obligations. Fund Types as follows: CG = Construction General, ARRA = American Recovery and Reinvestment Act, O&M = Operation and Maintenance FY92-97 and FY98-03 each depict 6 yrs combined funding, while FY04 - FY11 are annual obligation $$. Obligation totals depict actual execution and may not exactly match annual appropriations. O&M funds prior to FY2004 utilized for science, bird monitoring, etc, are not included in these figures.

*Information shared with MRRIC on 21 Oct 2011-updated on 24 Feb to reflect final FY12 work plan. $800k under MRERP expended prior to Congressional prohibition of MRERP funding.

List of U.S. Army Corps of Engineers, Omaha District
Shallow Water Habitat/Missouri River Mitigation Sites
May9, 2013

Description of constructed habitat types

1. **Chute Construction**

Chute construction involves the excavation of one or more flow through side channels with an entrance and an exit that are connected to the Missouri River. Sometimes secondary connections or tie channels are added in addition to the entrance and exit to provide additional chute dynamics and connectivity to the main channel. The multiple connections are referred to as secondary connections or tie channels. Chutes provide a dynamic environment with active bank and bar building processes. A properly formulated chute will function in both normal and high flow events. Chutes typically include one or more grade control structures to limit degradation within the chute and maintain the proper flow split between the chute and the main channel. Past experience has indicated that the chute flow should be about 6 to 8% of the main channel flow at the 50% August exceedance flow. Chutes provide dynamic, highly productive SWH that benefits the pallid sturgeon and other native Missouri River fish species.

2. **River Top-Width Widening**

Under this measure, SWH would be created along the edges of the main channel of the Missouri River by increasing the top width of the channel. Generally, the river top width in the channelized Missouri River in Nebraska and Iowa is about 700 feet. Projects are formulated with a goal of expanding the top width several hundred feet. Channel widening projects require the modification of the existing dikes to allow bank erosion. River structure modifications are intended to create SWH both directly, by causing deposition within the vicinity of the modified structure, and indirectly, by redirecting currents to the bank resulting in erosion. The structures used in channel widening projects typically consist of reverse sills, rootless dikes, dike notching, dike lowering, and chevrons. Channel widening results in the creation of shallow, low-velocity benches adjacent to the main channel with increased primary productivity making them attractive to pallid sturgeon and other native Missouri River fish.

3. **Backwater Construction**

Backwaters consist of off-channel habitat with a single connection to the Missouri River and relatively still water. Backwaters provide habitats protected from flow with emergent vegetation along the shoreline and high primary and secondary productivity. Backwaters serve as spawning, feeding, and rearing habitat for a large number of native fish species, and they are known to produce high volumes of food for the pallid sturgeon in the form of fish and macro-invertebrates. However, pallid sturgeon are not known to use the backwaters themselves due to the fact that they require flowing water.

Completed Corps Shallow Water habitat/Mitigation Projects that were excavated with a hydraulic dredge and the excavated material was discharged into the Missouri River.

1. Glovers Point Bend Chute and Backwater Project. Thurston County, NE. Winnebago Reservation. Rm 712

2. Hole-In-The-Rock Backwater Project. Thurston County, NE. Omaha Reservation.

3. Tieville-Decatur Backwater Project. Located on Iowa Side of the river in Burt county, NE and Monona County, IA. Combination of Corps owned land and State owned land. Rm 693

4. Middle Decatur Chute. Burt County, NE. Built in cooperation with the NRCS on an existing NRCS WRP easement.

5. Lower Decatur Chute Section 1135 Project. Burt County, NE. Cost shared project with the Papio-Missouri River NRD. Land owned by the NRD.

6. Fawn Island Chute. Harrison County, IA. Constructed on IDNR property.

7. Three Rivers Revetment Lowering Project. Harrison County, IA. Constructed on IDNR property.

8. Bullard Bend Backwater Project. Harrison County, IA on the Nebraska side of the river. Constructed in cooperation with the NRCS. Constructed on an existing NRCS WRP easement.

9. Soldier Bend Backwater. Harrison County, IA. Constructed on IDNR property.

10. Sandy Point Bend Chute. Harrison County IA on Nebraska side of the river. Constructed on Corps property.

11. Tyson Bend Backwater. Harrison County, IA. Large backwater constructed on IDNR property.

12. California Bend Chute and Backwater. Harrison County, IA. Constructed on IDNR property.

13. California Bend Chute Section 1135 Project. Washington County, NE. Cost shared project with the Papio-Missouri River Natural Resources District. Constructed on NRD property.

14. Lower Calhoun Chute and Boyer Bend Backwater. Washington County, NE. Small chute and large backwater constructed on USFWS property located within the Boyer Chute National Wildlife Refuge.

15. Council Bend Chute. Pottawattamie County, IA. Constructed on IDNR property.

16. Hidden Lake and Great Marsh Section 1135 Project. Sarpy County, NE. Cost Shared Project with the Fontenelle Forest Association. Constructed on Fontenelle Forest property.

17. Plattsmouth Bend Chute and Backwater. Cass County, NE. Constructed on NGPC property.

18. Upper Hamburg Bend Chute. Otoe County, NE. Constructed on Corps property.

19. Lower Hamburg Bend Chute. Fremont County, IA and Atchison County, MO. Constructed on Corps property.

20. Langdon Bend Backwater. Nemaha County, NE. Constructed on Corps property.

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Completed Corps SWH/Mitigation Projects where the excavated material was side-casted, not dredged.

1. William Gilmore-Tobacco Island Chute. Cass County, NE. Constructed on Corps property.

2. Kansas Bend Chute. Otoe and Nemaha County, IA. Constructed on Corps property.

3. Nishnabotna Bend Chute. Nemaha County, NE. Constructed on Corps property

Corps SWH/Mitigation Projects that are currently under construction where the excavated material is being hydraulically dredged and discharged into the Missouri River.

1. Lower Little Sioux/Deer Island River Top-Width Widening Project. Harrison County, IA. Major river top-width widening project located on IDNR property.

2. William Gilmore-Tobacco Island Chute Phase II. Cass County, NE. Constructed on Corps property

Corps SWH/Mitigation Projects that are currently in the Plan Formulation/Design Phase.

1. Glovers Point Backwater Rehabilitation. Thurston County, NE. Would be constructed on Winnebago Tribe property.

2. Hole-In-The-Rock Backwater Rehabilitation. Thurston County, NE. Would be constructed on Omaha Tribe property.

3. Middle Decatur Bend Backwater Reconnection. Burt County, NE on the Iowa side of the Missouri River. Would be constructed on Corps property.

4. Louisville Bend Pump Reconnection and Overwintering Hole Construction. Burt County, NE. Would be constructed on IDNR property.

5. Wilson Island State Park and Desoto National Wildlife Refuge Backwater Projects. Harrison County, IA on the Nebraska side of the Missouri River, and Pottawattamie County, IA. The two projects would be constructed on USFWS property within the Desoto NWR, and IDNR property within Wilson Island State Park.

6. Little Sioux Bend Chute Project. Harrison County, IA on the Nebraska side of the Missouri River. Would be constructed on Corps property.

Rm. 644

7. Indian Cave State Park Backwater Project. Richardson County, NE. Would be constructed on NGPC property within Indian Cave State Park.

68 mile