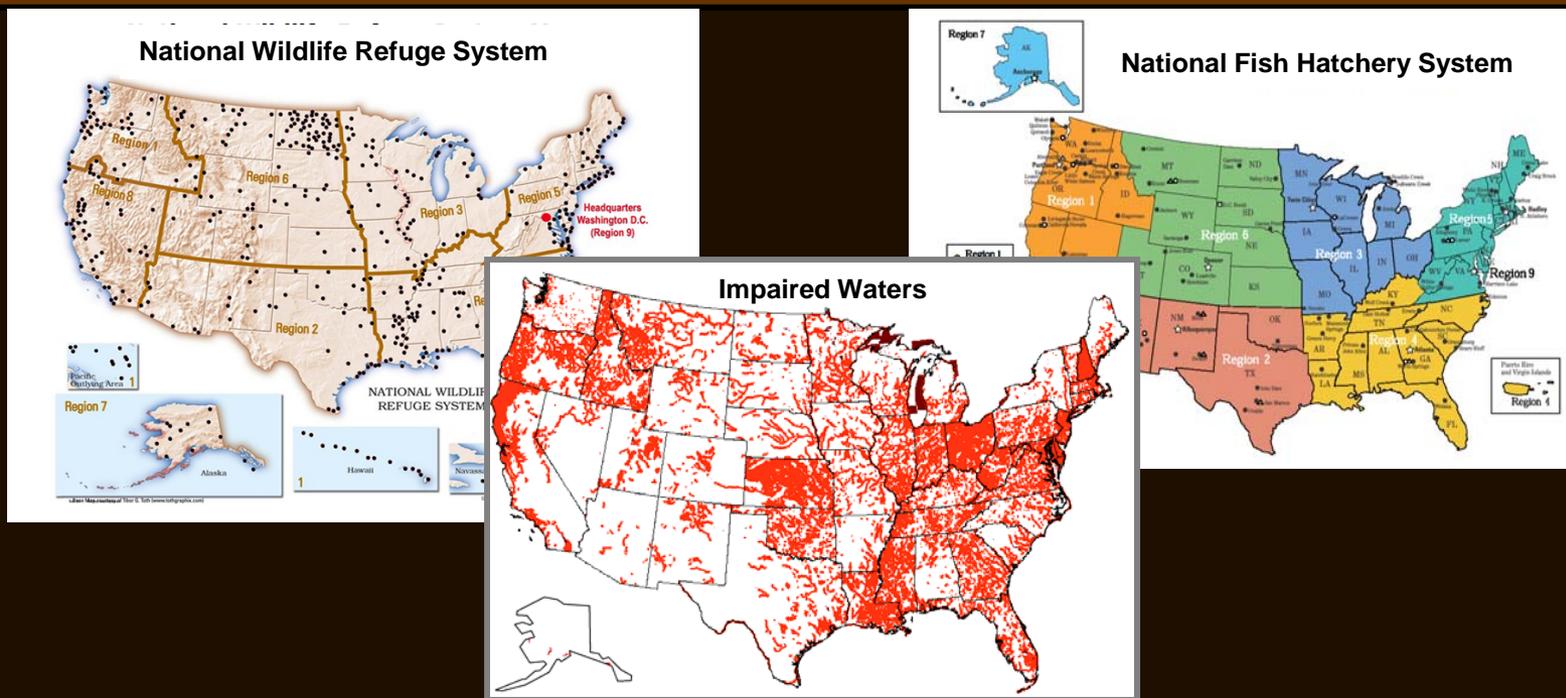


National Assessment of Impaired Waters

Within or Near

US Fish and Wildlife Service Properties



Douglas J. Norton¹, Seth Mann², Jamie Fowler¹, Jo Ellen Hinck³, Linda Lyon⁴, Susan Finger³, and Doug Vandegraff⁴

National Water Quality Monitoring Conference
Denver, CO ~ April 2010

1 EPA Office of Water; 2 Computer Sciences Corp; 3 US Geological Survey; 4 US Fish and Wildlife Service

Opening thoughts

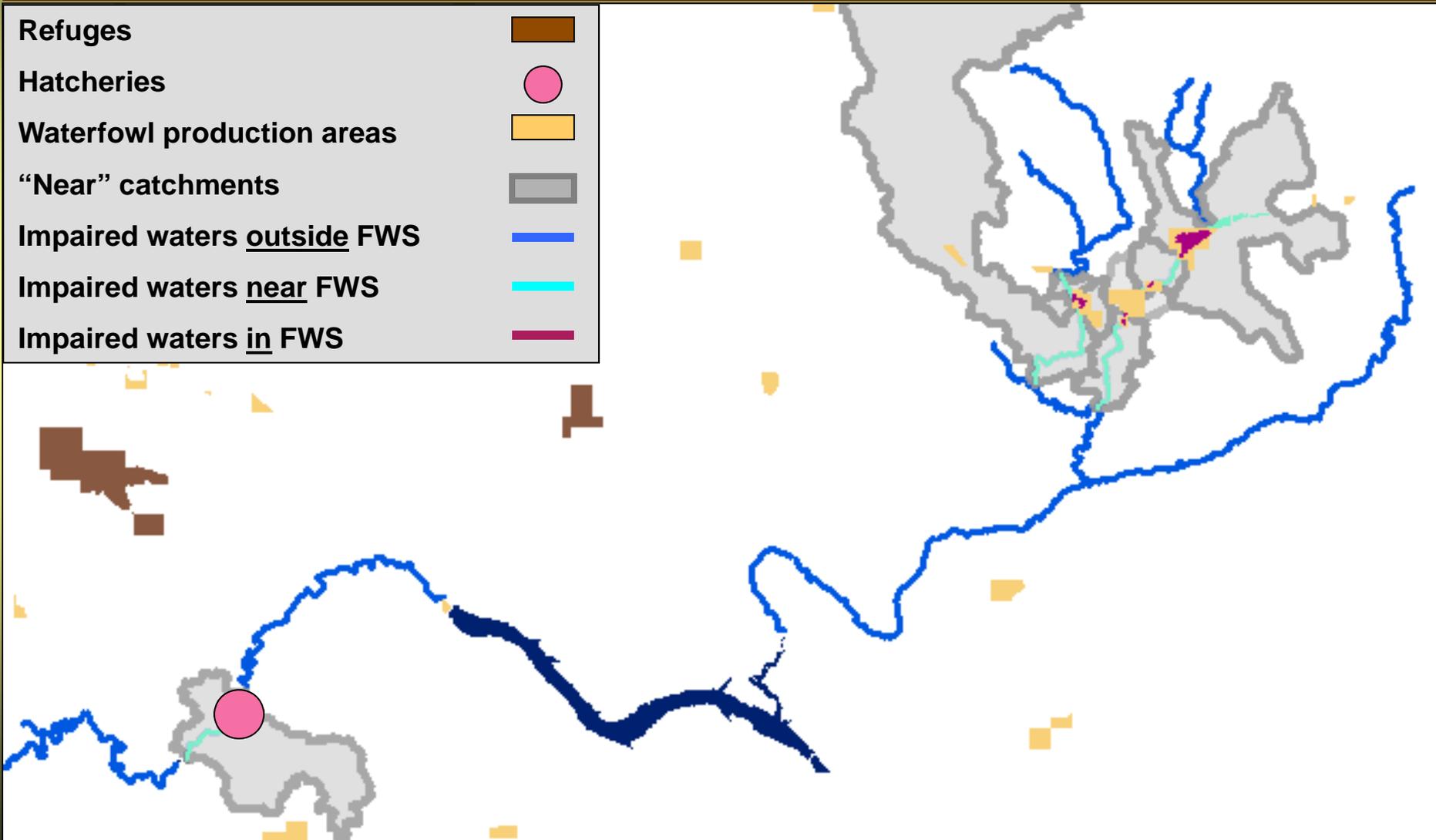
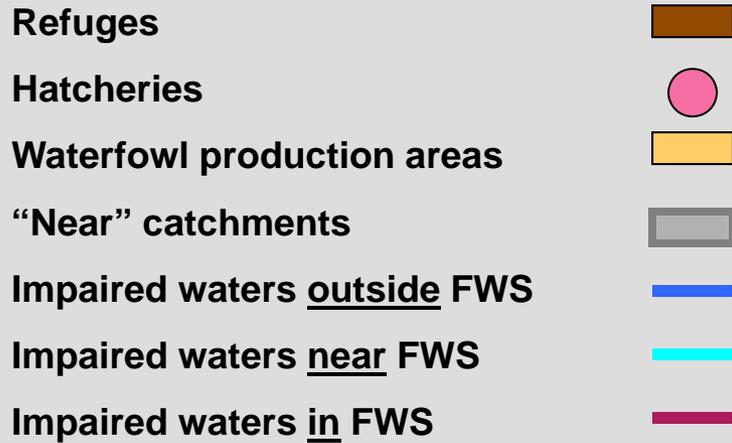
- Federal land management agencies manage 30% of US land
- Other federal agencies (USDA, DOT) substantially influence additional lands
- All agencies have stewardship responsibilities
- They want data on impaired waters on their lands
- This CANNOT BE DONE without impaired waters data in geospatial form... the great integrator

EPA Co-Occurrence Assessments

- Identify **impaired waters, pollutants, and existing TMDLs within and near** Federal properties using GIS
- Develop these data into interactive products that support Federal land management agency stewardship

...an FWS national co-occurrence assessment example...

FWS features assessed with the GIS data



The Bottom Line....

- **804 impaired waters** occur within or near FWS properties nationally (2% of US impaired waters listed in the 2002 baseline data)
- **303 FWS properties** are affected
- Total length of known linear impaired waters (within + near) = **10,755 km** (**6% of all river & stream length within FWS properties**)
- Total area of polygonal impaired waters (within + near) = **2,510 sq km**
- **Nutrients, oxygen depletion, pathogens and mercury** are most frequent causes
- **Distribution patterns (# occurrences per state) vary markedly** among impairment types
- **Products of this assessment** have been developed to assist FWS restoration planning and management at local to national scales

Five Products for FWS Users

1. *Database summary statistics*
2. *Pattern analyses*
3. *Master spreadsheets*
4. *GIS data, ArcReader browsable 'map'*
5. *User assistance: report, website*

Note: USGS Phase III products also coming in 2010

1. Summary Statistics

National Summary Statistics about impaired waters and FWS properties						
Measure	IN NWR	NEAR NWR	IN WPA	NEAR WPA	NEAR NFH	IN AND NEAR ALL
Number of impaired waters*	429	687	20	42	17	804
Number of properties affected*	178	248	17	31	15	303
Impaired length (km)	3,968	6,450	14	270	53	10,755
Impaired area (sq km)	1,251	1,195	4	60	0	2,510

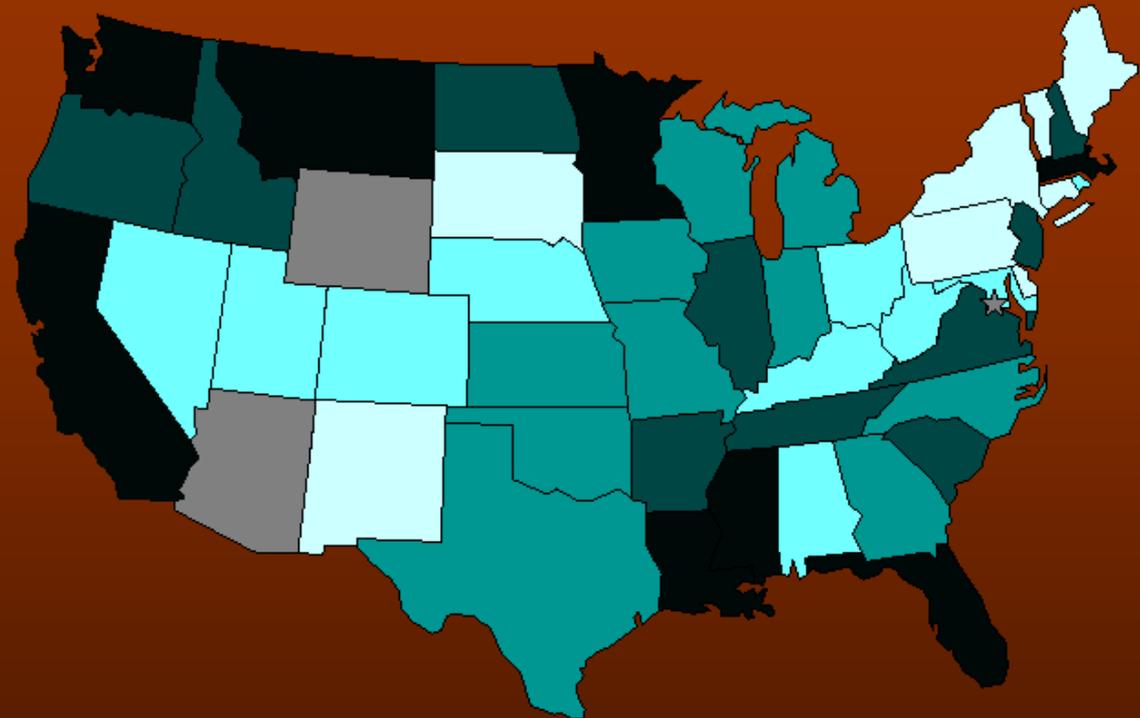
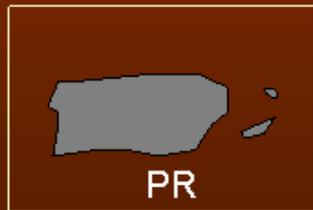
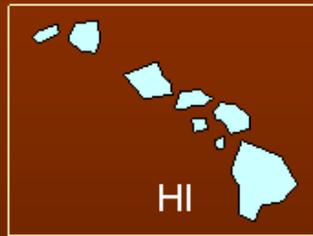
* - the same impaired water or property may be counted in more than one column

Top impairments for impaired waters within or near FWS properties
(ranked by frequency of occurrence)

1. Pathogens	8. Habitat Alteration
2. Nutrients	9. PCBs
3. Oxygen Depletion	10. Turbidity
4. Mercury	11. Temperature
5. Pesticides	12. Flow Alteration
6. Sediment	13. Total Toxicity
7. Metals (Other Than Mercury)	14. Salinity/TDS/Chlorides
	15. pH

2. Example Pattern Analysis

TOTAL IMPAIRED WATERS IN/NEAR FWS PROPERTIES BY STATE, BASED ON COUNT*



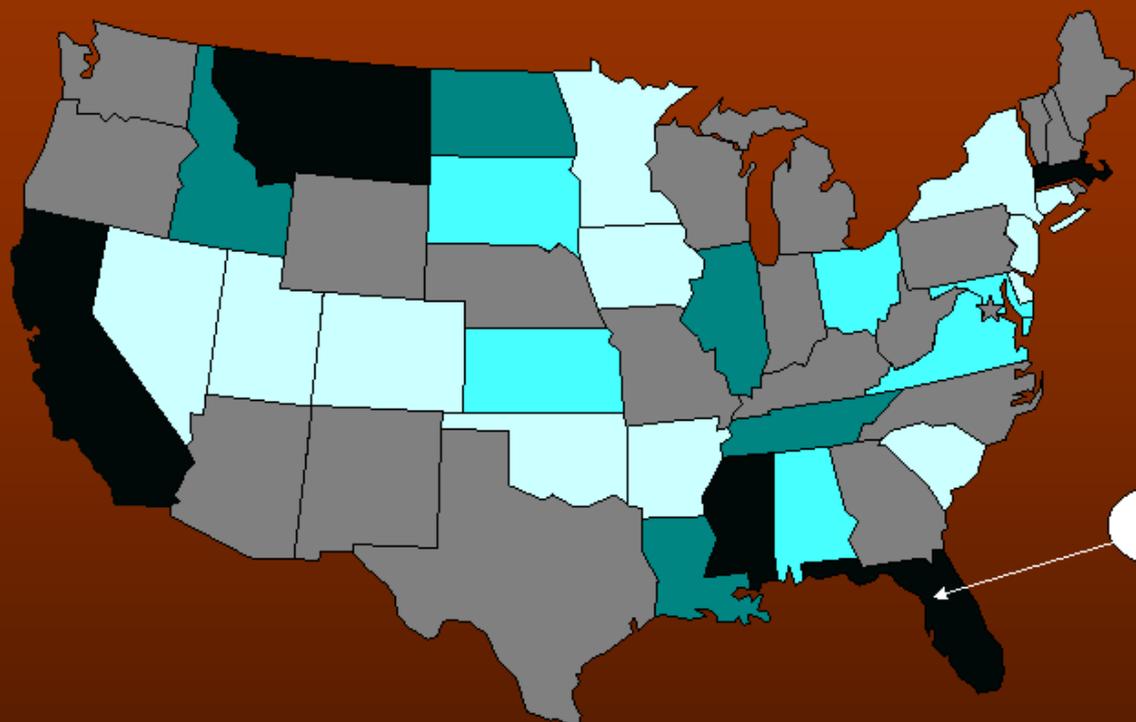
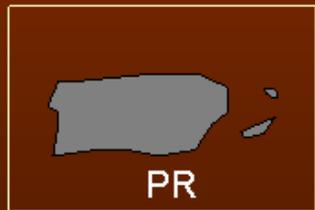
*NOTE: THE "IMPAIRED WATERS" COUNT REFERS TO

- a specific impaired water body or segment of a water body (as reported by the state using a specific List ID), and
- its location within or near FWS property



- 33-79 impaired waters in/near FWS properties**
- 18-30 impaired waters in/near FWS properties**
- 8-15 impaired waters in/near FWS properties**
- 4-7 impaired waters in/near FWS properties**
- 1-3 impaired waters in/near FWS properties**
- No impaired waters in/near FWS properties**

TOP IMPAIRMENTS IN/NEAR FWS PROPERTIES BY STATE NUTRIENTS (by count)



66

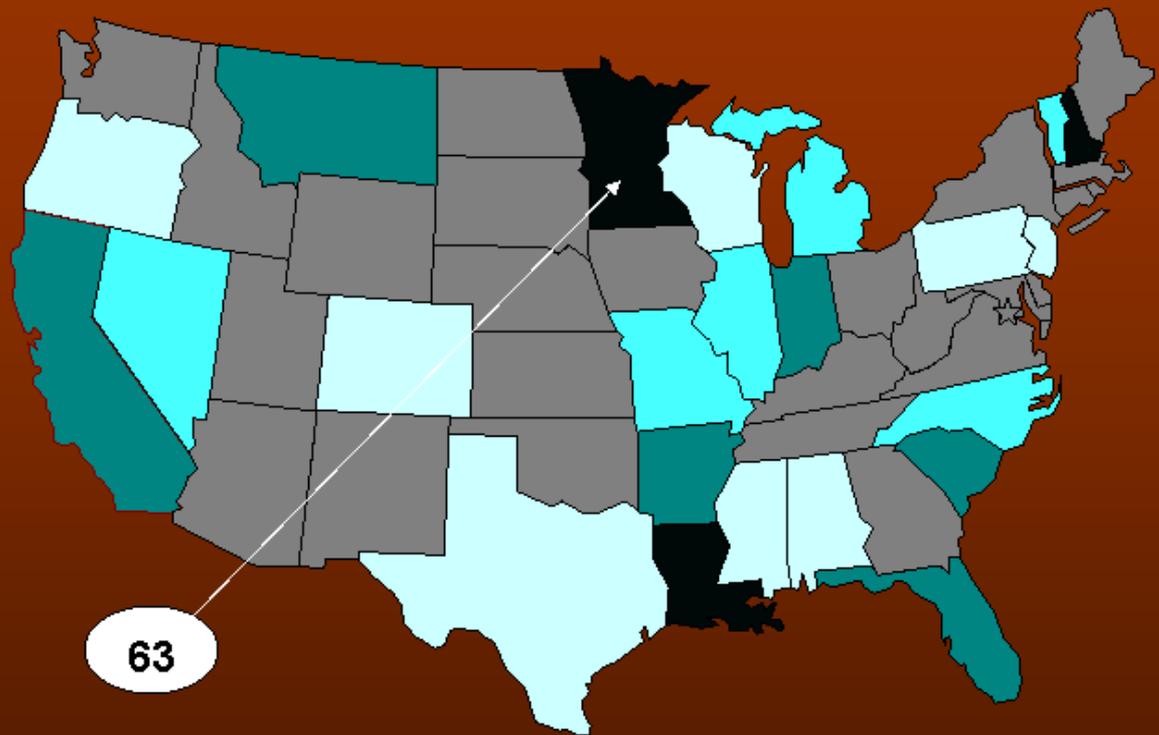
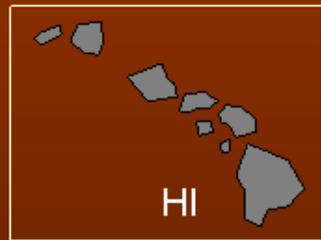
**Nutrients
National Rank:**

- #2 by count
- #1 by length
- #1 by area

- 31+ impairments in/near FWS properties
- 11-30 impairments in/near FWS properties
- 5-10 impairments in/near FWS properties
- 1- 4 impairments in/near FWS properties
- No nutrient impaired waters in/near FWS properties

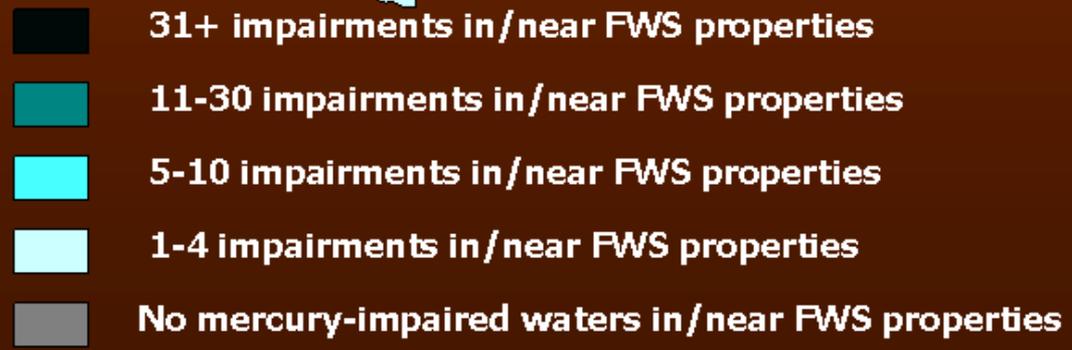
TOP IMPAIRMENTS IN/NEAR FWS PROPERTIES BY STATE

MERCURY (by count)



Mercury National Rank:

- #4 by count
- #4 by length
- #3 by area



3. Spreadsheets: sort for multi-scale data and visuals

Window Help Adobe PDF

Sort.

Filter.

Form...

Subtotals...

Chart Wizard - Step 1 of 4 - Chart ...

Standard Types Custom Types

Chart type: Column

Chart sub-type: 3D Column, 2D Column, 3D Bar, 2D Bar, 3D Pie, 2D Pie, 3D XY (Scatter), 2D XY (Scatter), 3D Doughnut, 2D Doughnut, 3D Radar, 2D Radar

Microsoft Excel - MASTER SUMMARY prototype FWS090329

File Edit View Insert Format Tools Data Window Help Adobe PDF

Arial 10 B I U

G33 SILTATION

	A	B	C	D	E	F									
	State	FWS property name	Type	List ID	Waterbody	Parent cause	Detailed Cause	Position	Linear count	Length	Polygon count	Area	FWS Region	EPA Region	
2	AK	KODIAK NATIONAL WILDLIFE REFUGE	NWR	AK-30102-409	RED LAKE ANTON ROAD PONDS	TOTAL TOXICITY	TOXIC & OTHER DELETERIOUS	IN			1	15.7580	7	10	
3	AK	KODIAK NATIONAL WILDLIFE REFUGE	NWR	AK-30102-409	RED LAKE ANTON ROAD PONDS	TOTAL TOXICITY	TOXIC & OTHER DELETERIOUS	NEAR		0.00000		0.00000	7	10	
4	AK	TETLIN NATIONAL WILDLIFE REFUGE	NWR	AK-40501-001	CABIN CREEK	TOTAL TOXICITY	TOXIC & OTHER DELETERIOUS	NEAR	1	5.20550		0.00000	7	10	
5	AL	BON SECOUR NATIONAL WILDLIFE REFUGE	NWR	AL03160205-070-02	BON SECOUR BAY	PATHOGENS	PATHOGENS	NEAR	1	39.99800		0.00000	4	4	
6	AL	BON SECOUR NATIONAL WILDLIFE REFUGE	NWR	AUGULF OF MEXICO_01	GULF OF MEXICO	MERCURY	MERCURY	IN	1	1.1245			4	4	
7	AL	BON SECOUR NATIONAL WILDLIFE REFUGE	NWR	AUGULF OF MEXICO_01	GULF OF MEXICO	MERCURY	MERCURY	NEAR	1	7.82520		0.00000	4	4	
8	AL	CAHABA RIVER NATIONAL WILDLIFE REFUGE	NWR	ALJCAHABA_R_04	CAHABA RIVER	NUTRIENTS	NUTRIENTS	IN	1	5.0823			4	4	
9	AL	CAHABA RIVER NATIONAL WILDLIFE REFUGE	NWR	ALJCAHABA_R_04	CAHABA RIVER	HABITAT ALTERATION	OTHER HABITAT ALTERATIONS	IN	1	5.0823			4	4	
10	AL	CAHABA RIVER NATIONAL WILDLIFE REFUGE	NWR	ALJCAHABA_R_04	CAHABA RIVER	SEDIMENT	SILTATION	IN	1	5.0823			4	4	
11	AL	CAHABA RIVER NATIONAL WILDLIFE REFUGE	NWR	ALJCAHABA_R_04	CAHABA RIVER	NUTRIENTS	NUTRIENTS	NEAR	1	1.4340		0.00000	4	4	
12	AL	CAHABA RIVER NATIONAL WILDLIFE REFUGE	NWR	ALJCAHABA_R_04	CAHABA RIVER	SEDIMENT	SILTATION	NEAR	1	1.4340		0.00000	4	4	
13	AL	CAHABA RIVER NATIONAL WILDLIFE REFUGE	NWR	ALJCAHABA_R_04	CAHABA RIVER	HABITAT ALTERATION	OTHER HABITAT ALTERATIONS	NEAR	1	1.4340		0.00000	4	4	
14	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-240-01	HUNTSVILLE SPRING BRANCH	OTHER TOXIC ORGANICS	PRIORITY ORGANICS	NEAR	1	3.33640		1.44320	4	4	
15	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-240-01	HUNTSVILLE SPRING BRANCH	OTHER TOXIC ORGANICS	PRIORITY ORGANICS	IN				1	0.8608	4	4
16	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-240-01	HUNTSVILLE SPRING BRANCH	OTHER TOXIC ORGANICS	PRIORITY ORGANICS	IN	1	0.1489			4	4	
17	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-250-01	INDIAN CREEK	OTHER TOXIC ORGANICS	PRIORITY ORGANICS	NEAR	1	0.79500		0.92190	4	4	
18	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-250-01	INDIAN CREEK	OTHER TOXIC ORGANICS	PRIORITY ORGANICS	IN				1	1.2368	4	4
19	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-330-01	FLINT CREEK	NUTRIENTS	NUTRIENTS	NEAR	1	0.98370		0.30760	4	4	
20	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-330-01	FLINT CREEK	SEDIMENT	SILTATION	NEAR	1	0.98370		0.30760	4	4	
21	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-330-01	FLINT CREEK	OXYGEN DEPLETION	ORGANIC ENRICHMENT/LOW DI	NEAR	1	0.98370		0.30760	4	4	
22	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-330-01	FLINT CREEK	PATHOGENS	PATHOGENS	NEAR	1	0.98370		0.30760	4	4	
23	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-330-01	FLINT CREEK	NUTRIENTS	NUTRIENTS	IN				1	1.3849	4	4
24	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-330-01	FLINT CREEK	OXYGEN DEPLETION	ORGANIC ENRICHMENT/LOW DI	IN				1	1.3849	4	4
25	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-330-01	FLINT CREEK	PATHOGENS	PATHOGENS	IN				1	1.3849	4	4
26	AL	WHEELER NATIONAL WILDLIFE REFUGE	NWR	ALJ06030002-330-01	FLINT CREEK	SEDIMENT	SILTATION	IN				1	1.3849	4	4
27	AR	BIG LAKE NATIONAL WILDLIFE REFUGE	NWR	AR08020204	MALLARD LAKE	NUTRIENTS	NUTRIENTS	NEAR		0.00000		1	1.07960	4	6
28	AR	CACHE RIVER NATIONAL WILDLIFE REFUGE	NWR	AR08020302-004-21.2	BAYOU DEVIEW	SEDIMENT	SILTATION	IN				1	0.0802	4	6
29	AR	CACHE RIVER NATIONAL WILDLIFE REFUGE	NWR	AR08020302-004-21.2	BAYOU DEVIEW	SEDIMENT	SILTATION	IN				1	0.0802	4	6
30	AR	CACHE RIVER NATIONAL WILDLIFE REFUGE	NWR	AR08020302-004-21.2	BAYOU DEVIEW	SEDIMENT	SILTATION	IN	1	30.7953			4	6	
31	AR	CACHE RIVER NATIONAL WILDLIFE REFUGE	NWR	AR08020302-004-21.2	BAYOU DEVIEW	SEDIMENT	SILTATION	IN	1	30.7953			4	6	
32	AR	CACHE RIVER NATIONAL WILDLIFE REFUGE	NWR	AR08020302-004-21.2	BAYOU DEVIEW	SEDIMENT	SILTATION	NEAR	1	3.84260		0.00000	4	6	
33	AR	CACHE RIVER NATIONAL WILDLIFE REFUGE	NWR	AR08020302-004-21.2	BAYOU DEVIEW	SEDIMENT	SILTATION	NEAR	1	3.84260		0.00000	4	6	
34	AR	CACHE RIVER NATIONAL WILDLIFE REFUGE	NWR	AR08020302-005-8.6	BAYOU DEVIEW	SEDIMENT	SILTATION	IN	1	0.8893			4	6	

3. Spreadsheets: Re-sorting data by watershed

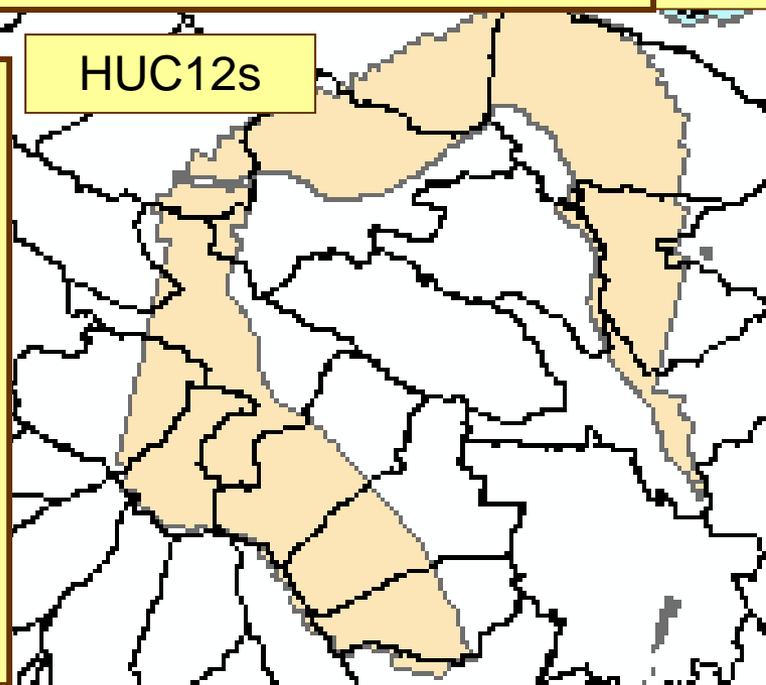
Project data were also sorted by watersheds with up to 25%, 50%, 75% or 100% FWS ownership:

- *Is FWS restoring impaired watersheds where FWS >50% owner?*
- *Is FWS protecting watersheds without impairments where FWS is the major owner?*

FWS/Impaired Waters STATISTICS by HUC12

# of HUC12s in 49 states (no AK)	83,084
# HUC12s with any impaired waters	26,646
# HUC12s with any FWS property	4,241
# HUC12s with FWS and impaired waters	1,583

HUC12s



4. GIS Data and Arc Reader Browsable Dataset

Browsing the 'read-only' dataset shows that a TMDL is done, and the TMDL ID is provided for obtaining the document online via EPA's ATTAINS Expert Query system.

The screenshot illustrates the workflow from a GIS feature to an online document. In the ArcGIS 'Identify' window, the 'TMDL Line' feature is selected, and its ID, 9495, is highlighted. This ID is used to query the EPA's ATTAINS system, which returns a list of TMDL documents for the Ecorse River. The resulting document is a PDF from the Michigan Department of Environmental Quality, detailing the Total Maximum Daily Load for Biota for the Ecorse River Watershed in Wayne County, Michigan, dated July 7, 2003.

Document Type	Document Sub-Type	Upload Date	Link
TMDL Document		11-FEB-08	http://www.epa.gov/waters/tmdl...
TMDL Document		11-FEB-08	http://www.epa.gov/waters/tmdl...ecorsetmdl.pdf

Michigan Department of Environmental Quality
Water Division
July 7, 2003
Total Maximum Daily Load for Biota
for the Ecorse River Watershed
Wayne County, Michigan

Assessment Report (in review)

Serves as:

- *overview of the national assessment*
- *primary results*
- *summary guide to each product and its uses*

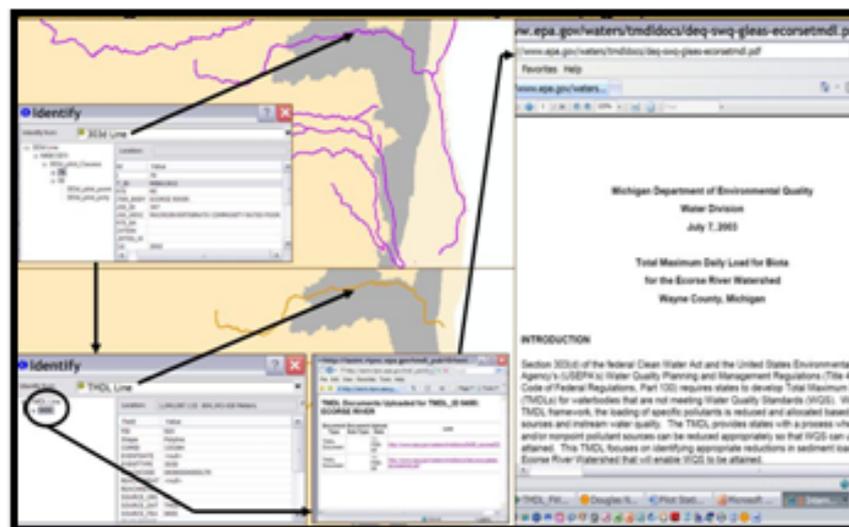
BUT --

***a simple document is
unable to contain the
interactive products***

A National Assessment of Impaired Waters

Within or Near

US Fish and Wildlife Service Properties



5. User Assistance: Web site

Federal Lands Studies

Contact Us

You are here: [EPA Home](#) > [Water](#) > [WATERS](#) > [Reporting](#) > Federal lands studies

Federal Lands Studies Home

Overview

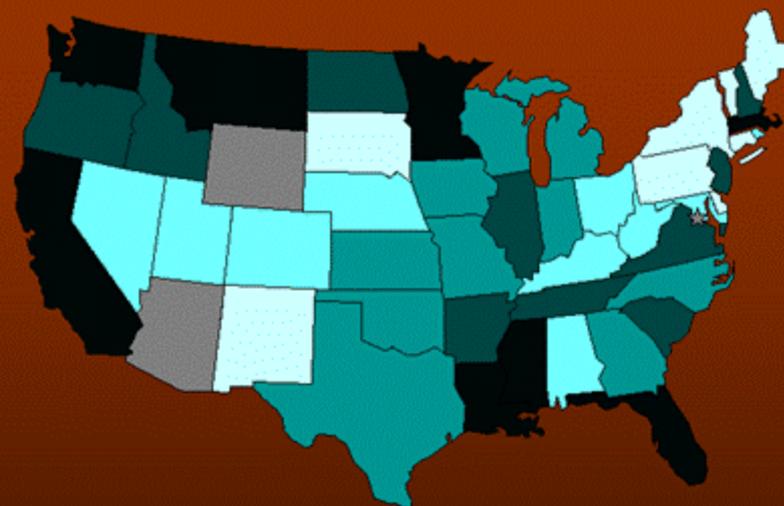
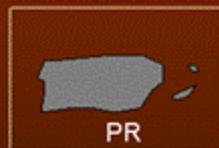
Assessments

- US Fish and Wildlife Service

- US Forest Service

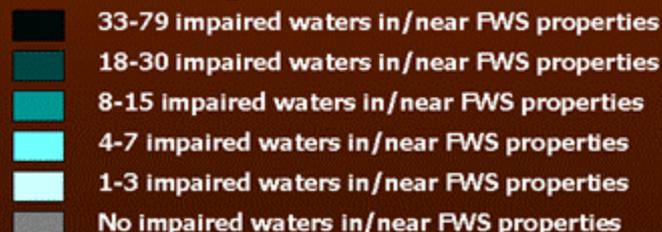
- Other Assessments

Contacts



*NOTE: THE "IMPAIRED WATERS" COUNT REFERS TO

- a specific impaired water body or segment of a water body (as reported by the state using a specific List ID), and
- its location within or near FWS property



Impaired Waters In/Near FWS Properties, by State/Territory

(see next slide for continued text)

A National Assessment of Impaired Waters Within or Near US Fish and Wildlife Service Properties

The EPA, FWS, and USGS collaborated during 2008-2009 in analyzing the co-occurrence of impaired waters and FWS properties using geospatial data. This effort produced several assessment products designed to help these agencies use better data about risks to aquatic systems within or near public lands. This Web page

makes available all of these assessment products and identifies those products requiring special skills. This site is hosted separately on the FWS Intranet and the EPA Intranet to provide internal access throughout both agencies.

Assessment Results Document

This 71-page document is the central information source for the assessment purpose, methods, findings, and products.

[Full Text of Final Report](#) (PDF, ___kb)

Summary Information

The 3-page Executive Summary is an overview of the assessment and its major findings. The four tables below summarize findings FWS-wide and for each of three property types individually.

[Executive Summary of Final Report](#) (PDF, ___kb)

[National Summary Table](#) (PDF, ___kb)

[National Wildlife Refuges Summary Table](#) (PDF, ___kb)

[National Fish Hatcheries Summary Table](#) (PDF, ___kb)

[Waterfowl Production Areas Summary Table](#) (PDF, ___kb)

Assessment Findings (Excel spreadsheets for download)

These are the summarized tabular data from the assessment. Users should be familiar with using Excel spreadsheets.

[Master Spreadsheet: FWS Properties, Waters, and Impairments](#) (XLS, ___ kb)

[Spreadsheet: Impaired Waters with Completed TMDLs](#) (XLS, ___ kb)

[Spreadsheet: HUC12 Watersheds with Impaired Waters](#) (XLS, ___ kb)

Assessment Geospatial Datasets (geospatial files for download)

These are the mapped data from the assessment. The ArcGIS files require fluency in GIS Technology; the ArcReader files are for broad audiences with average computer skills, but a freeware download is required (see below).

[FWS Properties/Impaired Waters National GIS Dataset](#) (ArcGIS files for download)

[Read-Only Version, FWS Properties/Impaired Waters National GIS Dataset](#) (ArcReader files for download)

NOTE: To browse the ArcReader product, first download [ArcReader Version 9.3](#)

[Tutorial: How to Use the FWS ArcReader Dataset](#)

[EXIT Disclaimer](#)

Outreach and Other Resources

[Overview Presentation on Assessment](#) (PPT, ___kb)

[Pattern Analysis National Maps](#) (PPT, ___kb)

[Clean Water Act Training Overview](#) (PPT, ___kb)

[Impaired Waters GIS Fact Sheets](#) (PDF, ___ kb)

Status and Plans

- *Co-occurrence assessments are a featured topic in the 2009 EPA Office of Wetlands, Oceans and Watersheds Report*
- *Forest Service national data analysis is also completed, agency support products being designed*
- *Other land management agencies in varying stages of discussion and/or planning*
- *Non-landowner agencies are another growing clientele (FHWA highway corridors, USDA watersheds with CRP proposals, OSMRE minelands/impaired waters co-occurrence)*