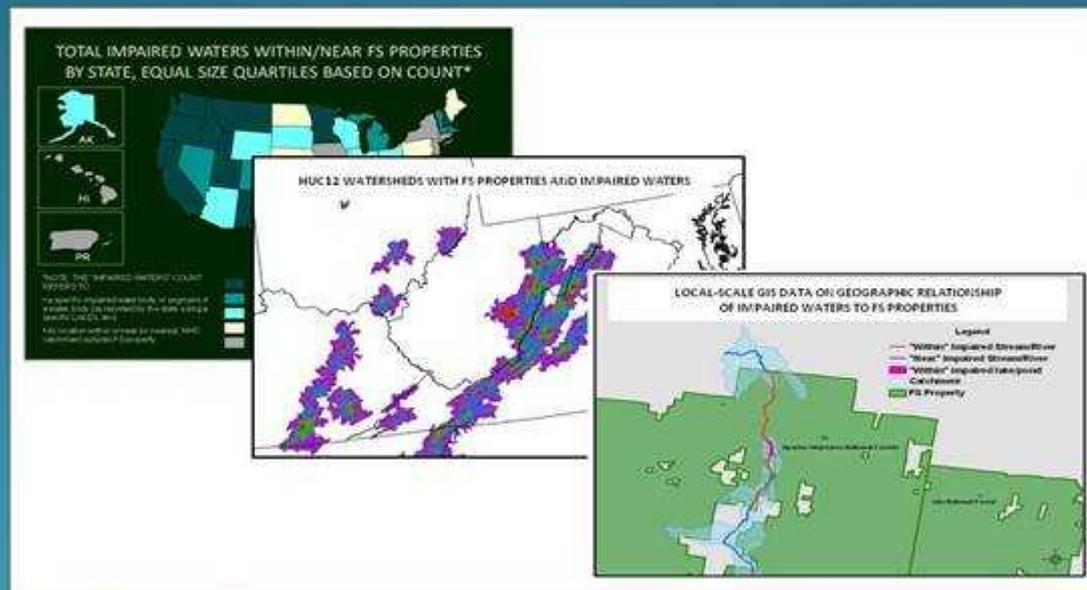


A National Study of Impaired Waters Within and Near National Forest System Lands



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Tatyana DiMascio⁴ and Barry Long²**

NWQMC - Portland, Oregon - May 2012

1: USEPA Office of Water; 2: US Forest Service Watershed, Fish, Wildlife, Air and Rare Plants Staff;
3: Innovate, Inc., USEPA Office of Water; 4: ORISE, USEPA Office of Water

Co-Occurrence Study Objectives

- Identify impaired waters, pollutants, and TMDLs within and near National Forest System (NFS) Lands using GIS
- Develop interactive products for routine use by FS and EPA in restoration and watershed management

This COULD NOT BE DONE without impaired waters data and FS property data in GIS format

Why document impaired waters on National Forest System Lands?

- Forest Service (FS) manages 8% of US land (federal land management agencies oversee 30% in total), much of it in headwaters and recharge areas for the nation's streams and aquifers.
- FS recognition of stewardship roles and responsibilities that influence health of US waters
- Increased FS policy emphasis on watershed management and sustaining high-quality waters

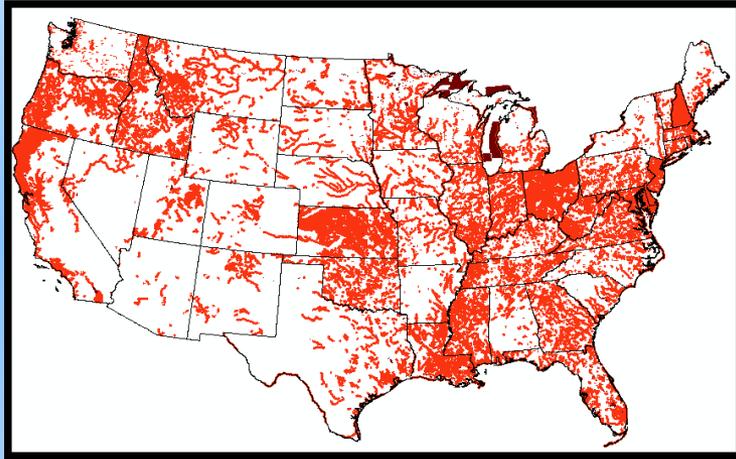
Why might impaired waters occur on National Forest System Lands?

Possible causes:

- legacy pollutants from pre-FS land use history
- land and water use practices during FS tenure
- pollutant transport from upstream sources
- aerial deposition

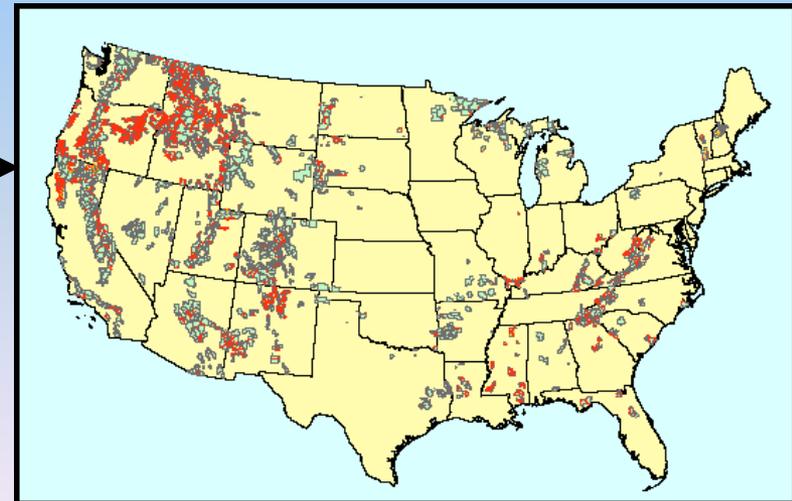
Geographic association alone does not diagnose cause

Assessment Methodology

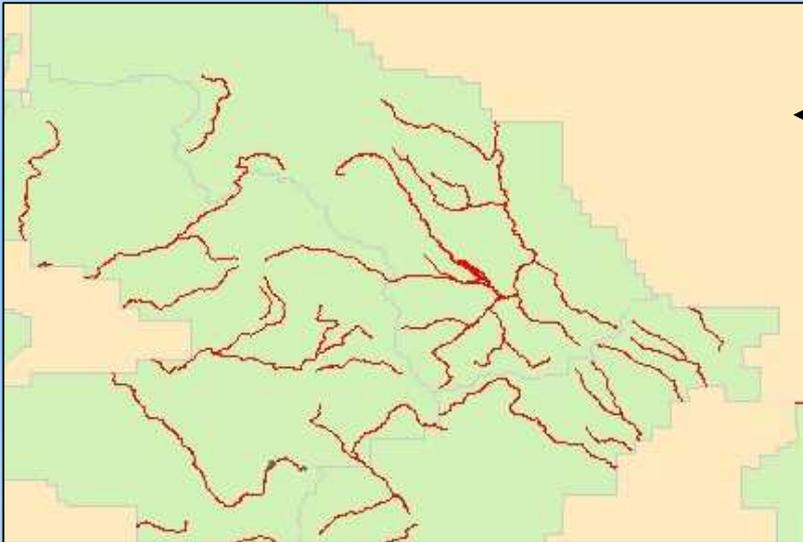


1.) EPA's national GIS coverage for impaired waters

2.) Overlay with National Forest System boundary maps

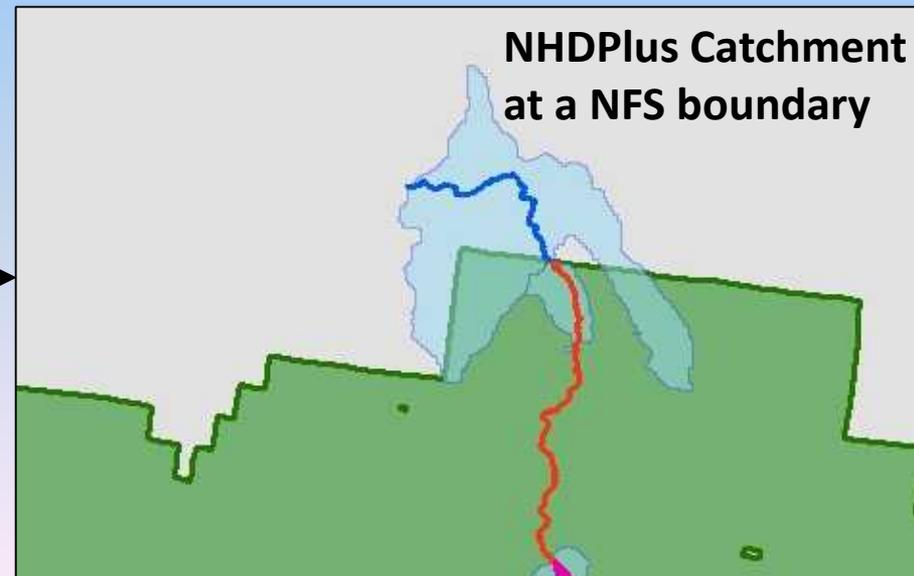


Assessment Methodology: Identify Near and Within Waters

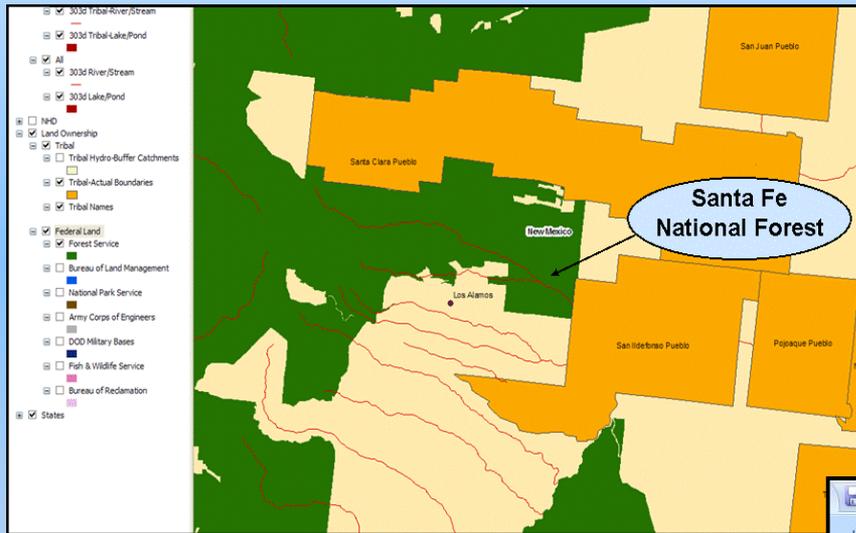


3.) Identify impaired waters
'wholly or partly within' NFS lands

4.) Identify impaired waters
'near but not within' NFS lands



Assessment Methodology: Compile GIS and Tabular Data



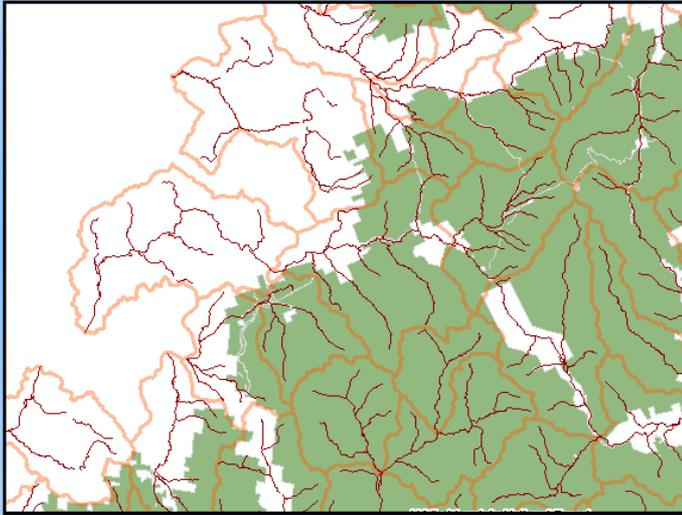
- ← 5.) Measure and compile impaired waters attributes
- *forest name, waterbody name*
 - *pollutant, impaired length & area, TMDLs*
 - *within or near, drainage direction*

- 6.) Develop spreadsheets as alternative format to GIS
- *impairments information*
 - *TMDLs information*
 - *HUC12s information*

MASTERSUM FSIMPAIRED 120406 - Microsoft Excel

STATE	FS FOREST UNIT NAME	LIST ID	WATER BODY	PARENT CAUSE	DETAILED CAUSE
AK	Tongass National Forest	AK-10301-014	PEDERSON HILL CREEK	PATHOGENS	FECAL COLIFORM
AR	Ouachita National Forest	AR08040203-1240	LAKE WINONA	MERCURY	MERCURY IN FISH TISSUE
AR	Ouachita National Forest	AR11110206-3600	LAKE NIMROD	MERCURY	MERCURY IN FISH TISSUE
AZ	Tonto National Forest	AZ15050100-014A	QUEEN CREEK	METALS (OTHER THAN COPPER)	
AZ	Coronado National Forest	AZ15050301-558A	THREE R CANYON	METALS (OTHER THAN CADMIUM)	
AZ	Coronado National Forest	AZ15050301-558A	THREE R CANYON	METALS (OTHER THAN COPPER)	
AZ	Coronado National Forest	AZ15050301-558A	THREE R CANYON	METALS (OTHER THAN ZINC)	
AZ	Coronado National Forest	AZ15050301-558A	THREE R CANYON	PH	PH
AZ	Coronado National Forest	AZ15050304-0080	ARIVACA LAKE	MERCURY	MERCURY
CA	Angeles National Forest	CA409.0740R	MONROVIA CANYON	METALS (OTHER THAN LEAD)	
CA	Inyo National Forest	CAL6031005119990128112146	TWIN LAKES (OWENS)	NUTRIENTS	PHOSPHORUS
CA	Inyo National Forest	CAL6031005119990128112146	TWIN LAKES (OWENS)	NUTRIENTS	NITROGEN
CA	Los Padres National Forest	CAR3098112419990222145136	ATASCADERO CREEK	OXYGEN DEPLETION	LOW DISSOLVED OXYGEN
CA	Los Padres National Forest	CAR3098112419990222145136	ATASCADERO CREEK	PATHOGENS	FECAL COLIFORM
CA	Los Padres National Forest	CAR310.220	CHORRO CREEK	NUTRIENTS	NUTRIENTS
CA	Los Padres National Forest	CAR310.220	CHORRO CREEK	PATHOGENS	FECAL COLIFORM
CA	Los Padres National Forest	CAR310.220	CHORRO CREEK	PATHOGENS	FECAL COLIFORM
CA	Los Padres National Forest	CAR310.220	CHORRO CREEK	SEDIMENT	SEDIMENTATION/SILTATION
CA	Los Padres National Forest	CAR3102201019990225114123	DAIRY CREEK	OXYGEN DEPLETION	LOW DISSOLVED OXYGEN
CA	Los Padres National Forest	CAR3102201019990225114123	DAIRY CREEK	PATHOGENS	FECAL COLIFORM
CA	Los Padres National Forest	CAR3102201120020124123809	PENNINGTON CREEK	PATHOGENS	FECAL COLIFORM
CA	Los Padres National Forest	CAR31022011200201001213514	CHUMASH CREEK	OXYGEN DEPLETION	LOW DISSOLVED OXYGEN
CA	Los Padres National Forest	CAR31022011200201001213514	CHUMASH CREEK	PATHOGENS	FECAL COLIFORM
CA	Los Padres National Forest	CAR3102201220020124134314	SAN BERNARDO CREEK	PATHOGENS	FECAL COLIFORM
CA	Los Padres National Forest	CAR315.310	SAN ANTONIO CREEK	SEDIMENT	SEDIMENTATION/SILTATION
CA	Los Padres National Forest	CAR315.320	ARROYO BURRO CREEK	PATHOGENS	PATHOGENS
CA	Los Padres National Forest	CAR4033100020020131115122	POLE CREEK (TRIBUTARY)	TOTAL DISSOLVED SOLIDS	TOTAL DISSOLVED SOLIDS

Assessment Methodology: Relate Near-FS and Within-FS Waters to Watersheds



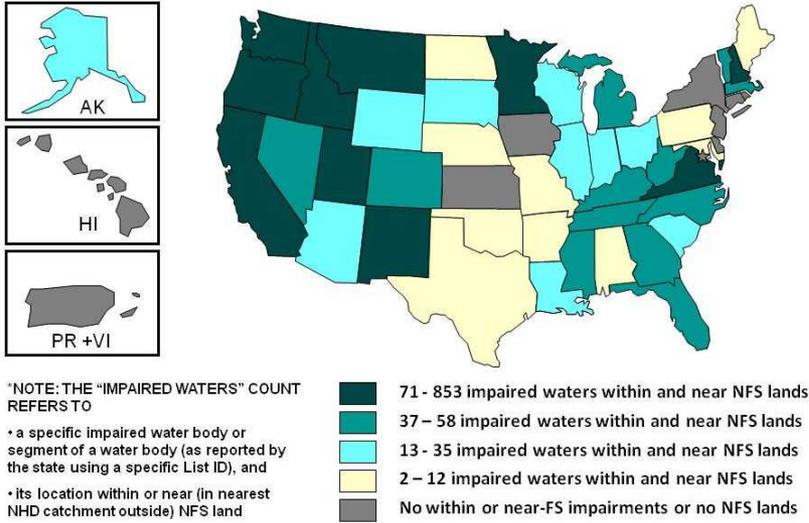
7.) Identify HUC12s containing NFS lands and impaired waters

8.) Re-aggregate waters information on HUC12 basis

12	NAME	STATES	HUC_AREA	FS_AREA	PCT_FS
010400010605	Horne Brook-Androscoggin	NH	106.3306	1.0205	0.96
010400010606	Dead River-Androscoggin	NH	81.3813	2.6324	3.23
010400020101	Moose River-Moose Brook	NH	99.6361	31.8109	31.93
010400020102	Peabody River	NH	127.6274	115.8425	90.77
010400020103	Lary Brook-Androscoggin	ME,NH	173.4161	50.2001	28.95

Assessment Methodology: Pattern Analysis and User Support Products

TOTAL IMPAIRED WATERS COUNT WITHIN AND NEAR NFS LANDS



9.) Conduct pattern analyses of impairment extent, magnitude

10.) Develop products that improve data availability and use:

- GIS database and ArcReader browsable maps*
- Summary statistics*
- Pattern analyses*
- Master spreadsheets*
- User assistance: report, website*

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Federal Lands Studies

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A National Assessment of Impaired Waters Within or Near US Forest Service Properties

Overview
US Fish and Wildlife Service
US Forest Service
Other Assessments

US Top 5 States by count (and % of national FS total)
AK Top 10 States by count (and % of national FS total)
32 other States with impaired waters within/near in FS lands
No impaired waters within/near FS lands

Impaired Waters In/Near Forest Service Properties, by State/Territory

The EPA and FS are collaborating during 2010 in analyzing the co-occurrence of impaired waters and FS properties using geospatial data. This effort will produce several assessment products designed to help these agencies use better data about risks to aquatic systems within or near FS lands. This Web page will make available all of these assessment products and identify those products requiring special skills.

Study Results: National Totals

National Summary Statistics about Impaired Waters and NFS Lands*			
Measure	WITHIN NFS LANDS	NEAR NFS LANDS	WITHIN AND NEAR TOTAL
Impaired waters count [% of US impaired waters]	3,126 [7.9%]	3,426 [8.7%]	4,212 [10.6%]
Impaired length in miles	20,324	15,827	36,151
Impaired area in sq mi	262	1,531	1,793

** These numbers are based on geographic co-occurrence, which does not necessarily imply causality.*

Study Results: Impairment Types

Parent Impairment Categories, rank-ordered by frequency within and near NFS lands*	Total impairment length [rank]	Total impairment area [rank]	Count
Temperature	17180 [1]	49 [10]	2,266
Mercury	2475 [8]	968 [1]	1,666
Habitat Alteration	7153 [5]	5 [11]	1,475
Sediment	13889 [2]	152 [5]	1,388
Metals [other than Hg]	7906 [4]	87 [8]	1,382
Flow Alteration	4429 [6]	117 [6]	877
Nutrients	7922 [3]	443 [2]	759
Pathogens	2383 [9]	3 [12]	670
Oxygen Depletion	3804 [7]	174 [3]	366
pH	1681 [11]	99 [7]	349
Cause Unknown	1171 [13]	<1 [13]	321
Turbidity	1635 [12]	164 [4]	264
Cause Unknown, Bioimpairment	616 [14]	<1 [14]	185
Salinity/TDS/Chlorides	1764 [10]	69 [9]	179
Other parent categories [17 each < 0.6%]	2315 [n/a]	348 [n/a]	469

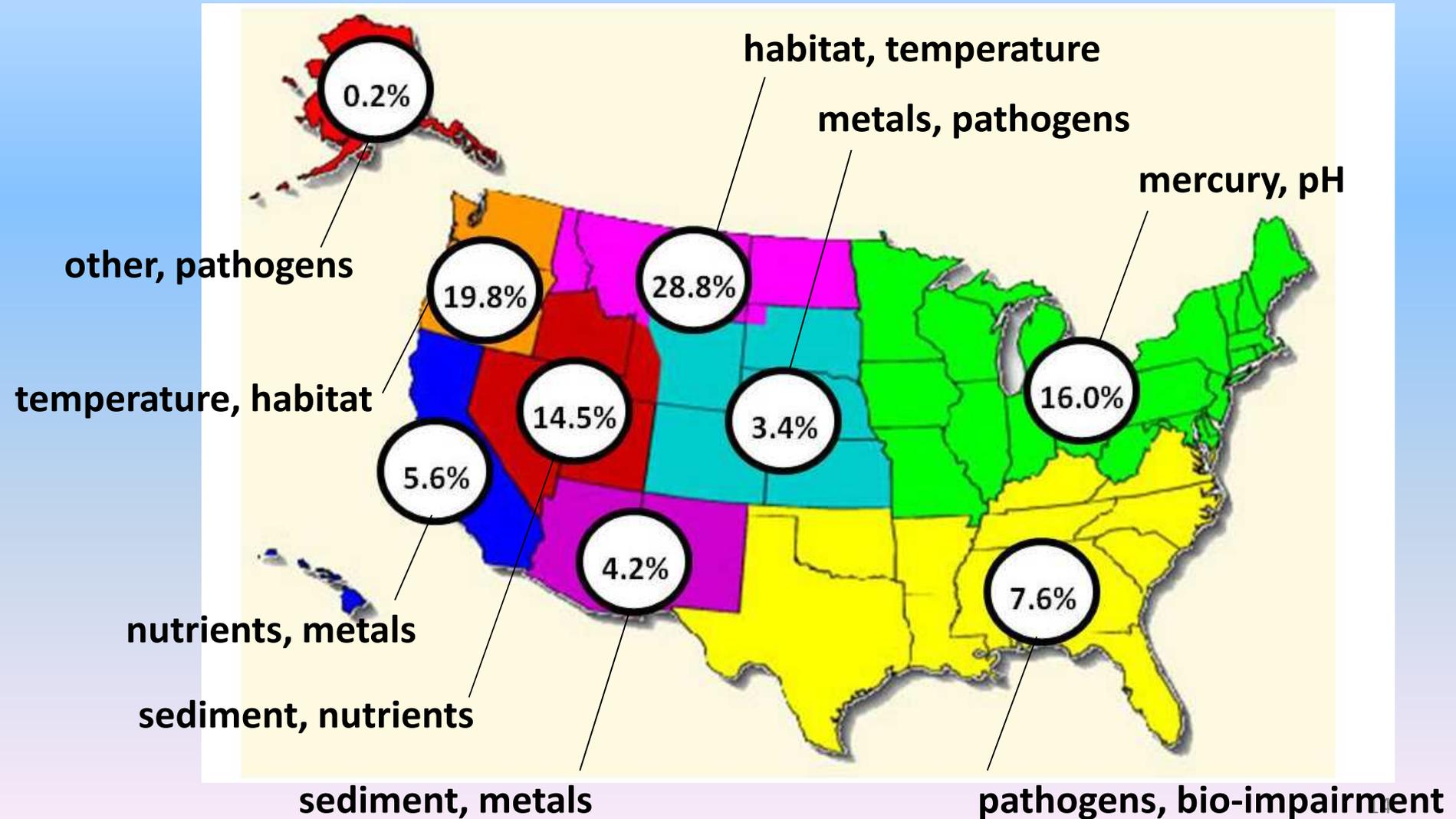
Study Results: TMDLs

PARENT CAUSE CATEGORY	# TMDLS	% OF NFS TMDLS
MERCURY	712	28%
TEMPERATURE	489	19%
METALS	327	13%
SEDIMENT	258	10%
PATHOGENS	208	8%
NUTRIENTS	191	8%
TURBIDITY	93	4%
PH/ACIDITY	76	3%
ENRICHMENT/O2 DEPLETION	55	2%
SALINITY/TDS/CHLORIDES	26	1%
AMMONIA	24	1%
PESTICIDES	19	1%
12 OTHER CATEGORIES (<1% EACH)	52	----
TOTAL NFS-RELATED TMDLS (3/2011)	2530	

Study Results: HUC12s with NFS lands

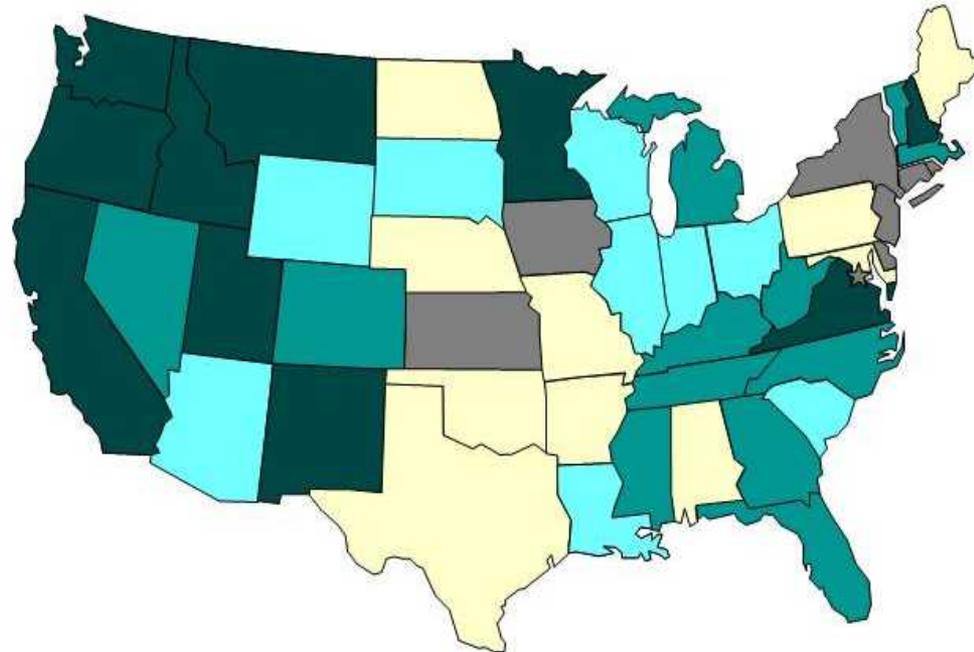
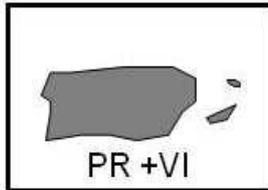
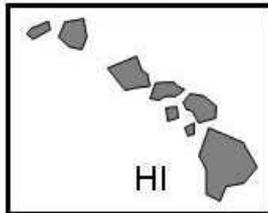
Total FS HUC12 Count	FS HUC12s w/no impaired waters reported	% of all FS HUC12s	FS HUC12 w/1 or more impaired waters reported	% of all FS HUC12s	FS HUC12s w/5 or more impaired waters reported	% of all FS HUC12s
17,373	12,052	69.4%	5,321	30.6%	256	1.5%

Study Results: Regional Patterns



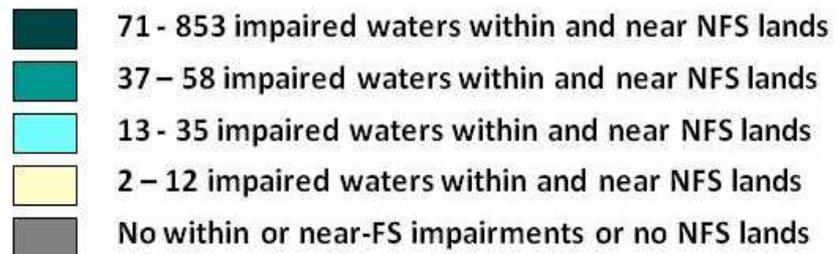
Study Results: State Patterns

TOTAL IMPAIRED WATERS COUNT WITHIN AND NEAR NFS LANDS



*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 (in nearest NHD catchment outside) NFS land



Study Results: Local Patterns

A TMDL is done for this example water, and the TMDL ID is provided for obtaining the document online via EPA's ATTAINS Expert Query system.

Identify

Identify from: **TMDL Line**

TMDL Line
9495

Location: 1,040,087.132 604,343.428 Meters

Field	Value
FID	920
Shape	Polyline
COMID	135384
EVENTDATE	<null>
EVENTTYPE	303D
REACHCODE	04090004000179
REACHSMDAT	<null>
REACHRESOL	
SOURCE_ORI	MI
SOURCE_DAT	TMDL
SOURCE_FEA	9495
FEATURESET	

http://iasint.rtpnc.epa.gov/tmdl_pub10/text...

http://iasint.rtpnc.epa.gov/tmdl_pub10

File Edit View Favorites Tools Help

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Page Tools

TMDL Documents Uploaded for TMDL_ID 9495: ECORSE RIVER

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

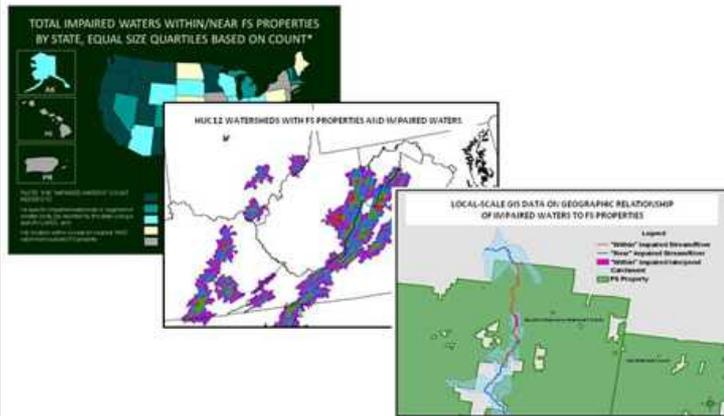
RODUCTION

on 303(g) of the federal Clean Water Act and the United States Environmental Protection Agency's (USEPA's) Water Quality Planning and Management Regulations (Title 40 of Federal Regulations, Part 130) requires states to develop Total Maximum Daily Loads (TMDLs) for waterbodies that are not meeting Water Quality Standards (WQS). With the TMDL framework, the loading of specific pollutants is reduced and allocated based on point and nonpoint pollutant sources can be reduced appropriately so that WQS can be achieved. This TMDL focuses on identifying appropriate reductions in sediment loading to the Ecorse River Watershed that will enable WQS to be attained.

16

User Assistance

Assessment Report and Website



National Report on Impaired Waters

Within and Near

National Forest System Lands

Final Report

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A National Assessment of Impaired Waters Within or Near US Forest Service Properties

Impaired Waters In/Near Forest Service Properties, by State/Territory

Legend

- Top 5 States by count (and % of national FS total)
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- 32 other States with impaired waters within/near in FS lands
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Value of Assessment

- Easily retrievable information on water quality issues for NFS managers
- Can be merged with other GIS data sets and analyses
- Basis for restoration and protection planning
- Basis for collaboration with other federal, state and tribal agencies and the private sector

Improved access to impaired waters information that supports federal land stewardship at any geographic scale