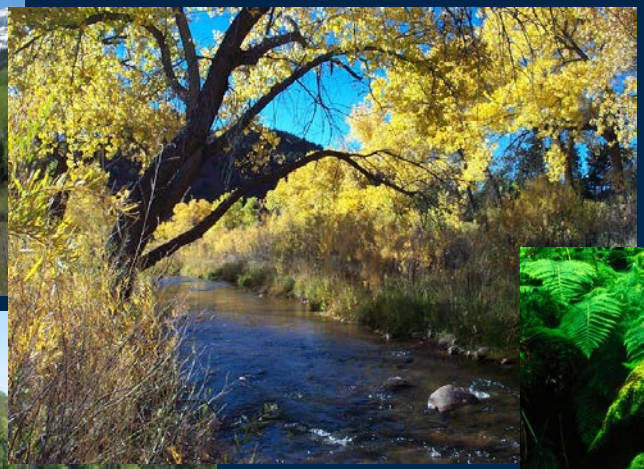
Mechanisms for Display:
Soil & Water Data



Peter Gaulke (US) & Tim Payn (NZ)

December 5, 2012

What to Do With these Mechanisms for Display?

www.MontrealProcess.org

montrealprocess.org

The Montréal Process

Forests, Our Key to a Healthy Environment and a Healthy Economy

Select Language

Montréal Process Home | Contact Us

Home: The Montréal Process

Search

- The Montréal Process Home

The Montréal Process

- About Us
- Member Countries
- Working Group
- Technical Advisory Committee
- Montréal Process Contacts

Addressing Global Forest Challenges

- Network of Knowledge
- Climate Change
- Biodiversity
- Bioenergy
- Water

Resources

- Criteria and Indicators

The Montréal Process

The Montréal Process Working Group was formed in 1994 as a bold, intergovernmental response to the pressing need for sustainable forest management. One of its first tasks was to develop and implement internationally agreed-upon criteria and indicators for the conservation and sustainable management of temperate and boreal forests.

The Montréal Process countries are Argentina, Australia, Canada, Chile,

Spotlight

- Exploring stakeholder-based indicators to report on safeguards for REDD+ and sustainable forest management: A paper produced collaboratively by the Montreal Process, ITTO, FAO and FOREST EUROPE (PDF, 490 KB)
- Joint statement of The Montréal Process, International Tropical Timber Organization, FOREST EUROPE, and the Food and Agriculture Organization of the United Nations' Global Forest Resources Assessment, January 5, 2012
- Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, Fourth Edition

Forest Sustainability Reporting in the United States

Soil & Water Indicators
At What Scale?

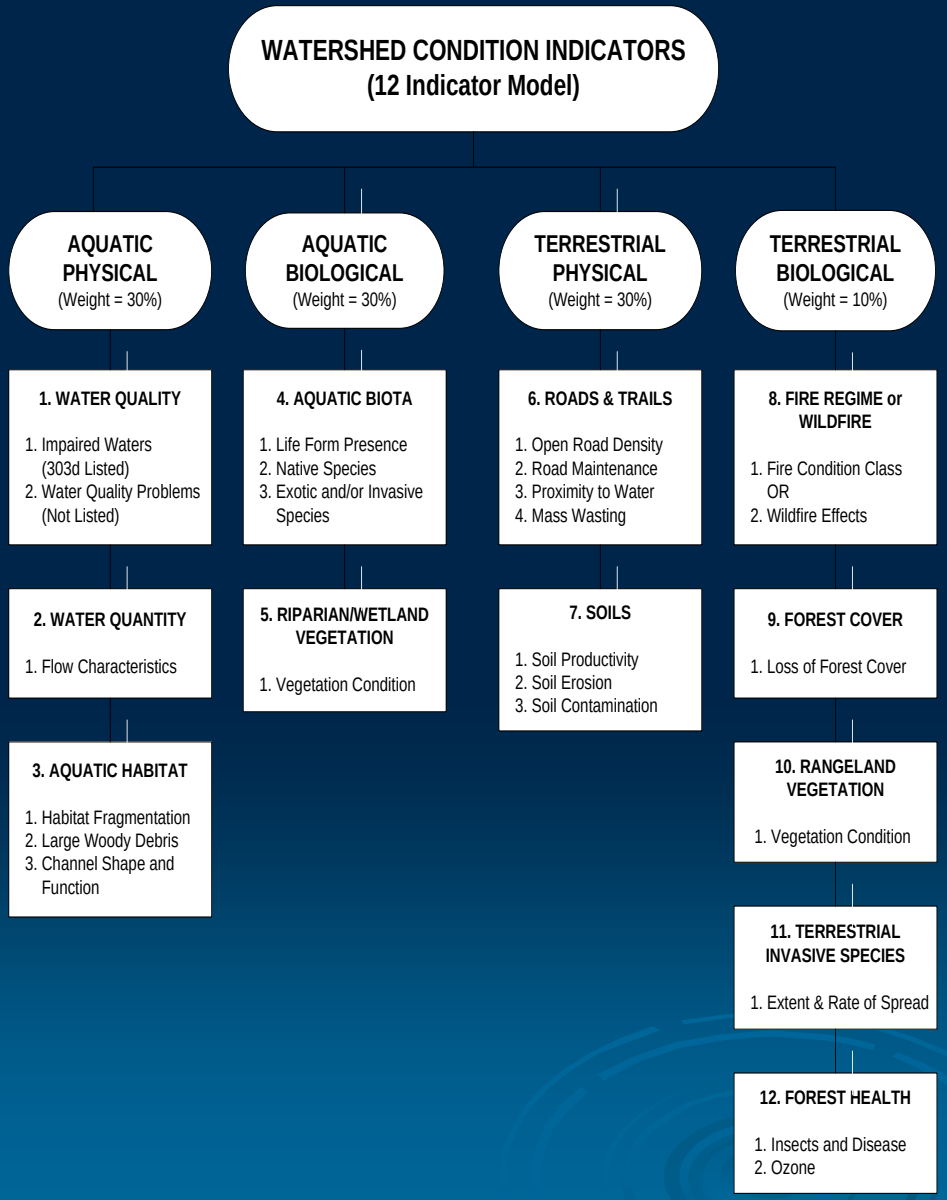
- Watershed Scale
- Landscape Scale
- Catchment, Basin or Riverine System
- Sub-National Reporting
- National Reporting

Definitions

Watershed Condition

The state of the physical and biological characteristics and processes within a watershed that affect the hydrologic and soil functions supporting aquatic ecosystems.

Watershed Condition Indicators



1. Water Quality
2. Water Quantity
3. Aquatic Habitat
4. Aquatic Biota
5. Riparian/Wetland Vegetation
6. Roads and Trails
7. Soils
8. Fire Regime or Wildfire
9. Forest Cover
10. Rangeland Vegetation
11. Terrestrial Invasive Species
12. Forest Health

Watershed Condition Indicators

Key Characteristics

1. National Forest-based reconnaissance-level office evaluation of watershed condition
2. Achievable within existing budgets and staffing
3. A core set of 12 national watershed condition indicators
4. Relies on professional judgment exercised by Forest interdisciplinary teams, local data, and GIS data layers and national databases to the extent they are available

Watershed Condition Classification - the process of describing watershed condition in terms of discrete categories (or classes) that reflect the level of watershed health or integrity. The classes are: 1) functioning properly; functioning at risk; impaired function.

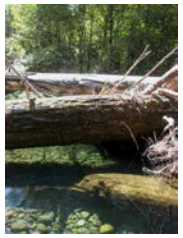
Staley Creek Sub-watershed

Willamette National Forest

WCF Model Indicators and their ratings

Aquatic Biota Condition	Poor
Riparian/Wetland Vegetation Condition	**Fair**
Water Quality Condition	Good
Water Quantity Condition	**Good**
Aquatic Habitat Condition	Poor
Road and Trail Condition	**Poor**
Soil Condition	Good
Fire Regime Condition Class	**Fair**
Forest Cover Condition	Good
Forest Health Condition	**Good**
Terrestrial Invasive Species Condition	Good

Willamette National Forest Aquatic System Strategic Objectives



Forest Strategic Goals (Forest Scale)

Develop integrated principles that articulate our approach to making aquatic systems more resilient in light of existing needs and anticipated future conditions.

Watershed Action Plans (5th Field Scale)

Develop Watershed Action Plans for each of the Forest's priority watersheds (Upper Middle Fork Willamette, South Fork McKenzie, South Santiam and, Upper North Santiam)

Watershed Condition Framework (6th Field Scale)

As part of the Watershed Condition Framework (WCF) Assessment, complete 6th field scale watershed restoration plans that identify priority projects.

Partnership and Collaboration (Multiple Scales)

Work with partners to implement and monitor restoration activities.

Riparian/Wetland Vegetation Condition

Data Sources: AREMP WCF riparian analysis

Projects:

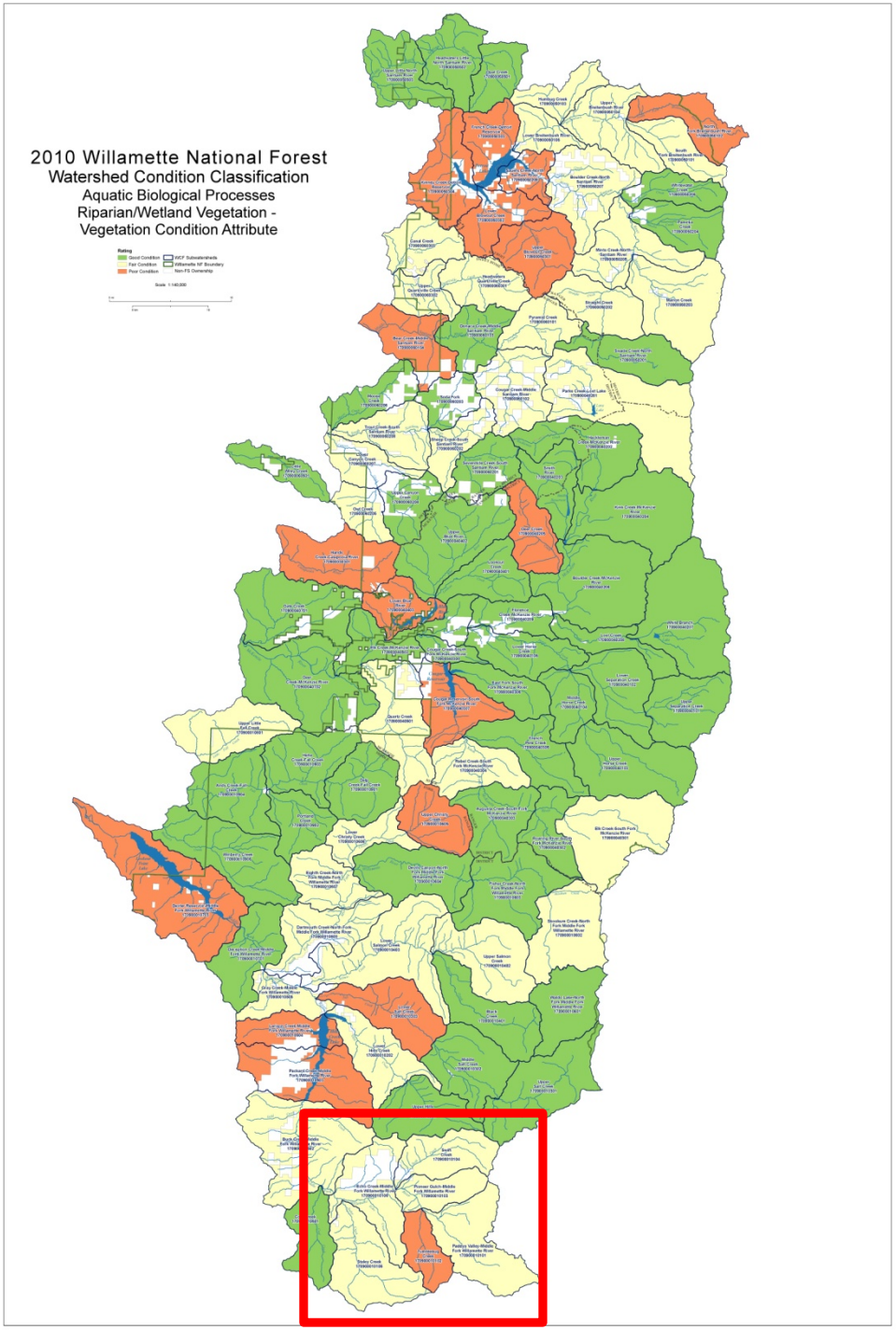
Commercial thinning in Riparian Reserves – direct effect on structure and complexity

Non-commercial thinning in Riparian Reserves – direct effect on structure and complexity. Thinning and placement of small wood in-stream – fall and leave or fall and carry

Riparian planting – direct effect over the long term

Wet Meadow Treatment – direct effect on wetland dependent ecosystems but small number of acres.

Respect the River Projects – direct and indirect effects, protection and restoration of riparian sites but small number of acres.



In-stream Large Wood

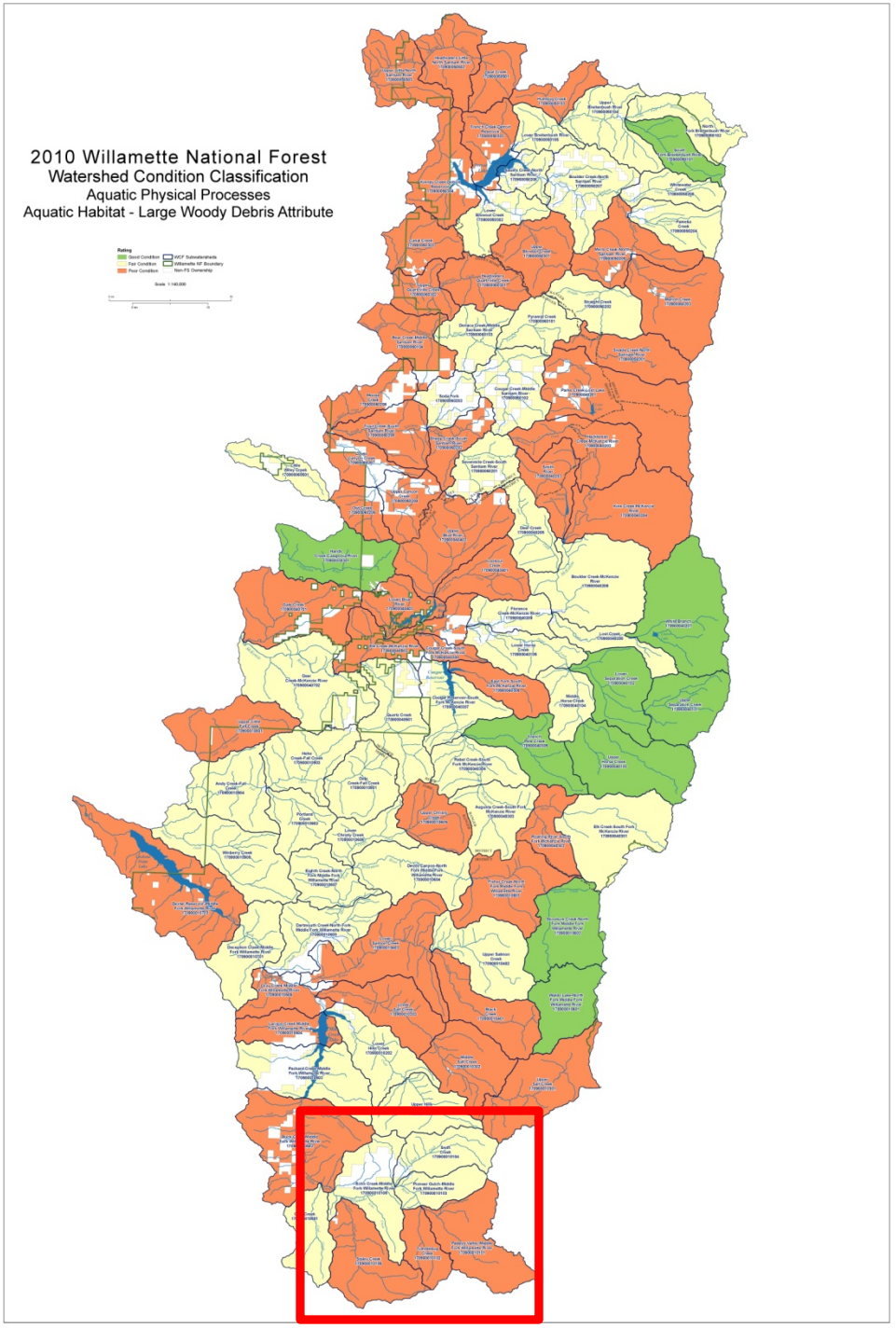
WCF Standards

Good (1): Greater than 80 pieces of wood per mile larger than 24" at 50 feet (Watershed Action Plan, PACFISH).
Fair (2): Less than 80 pieces but greater than 40 pieces of wood per mile larger than 24" at 50 feet.
Poor (3): Less than 40 pieces of wood per mile larger than 24" at 50 feet.
Professional judgment was used when little or no data was available, or when the final rating was bordering between two ratings and the district aquatics personnel had direct knowledge of conditions.

Projects:

In-stream wood placement with an 80 piece per mile target – direct benefit

Fall and Leave in channel in overstocked managed stands



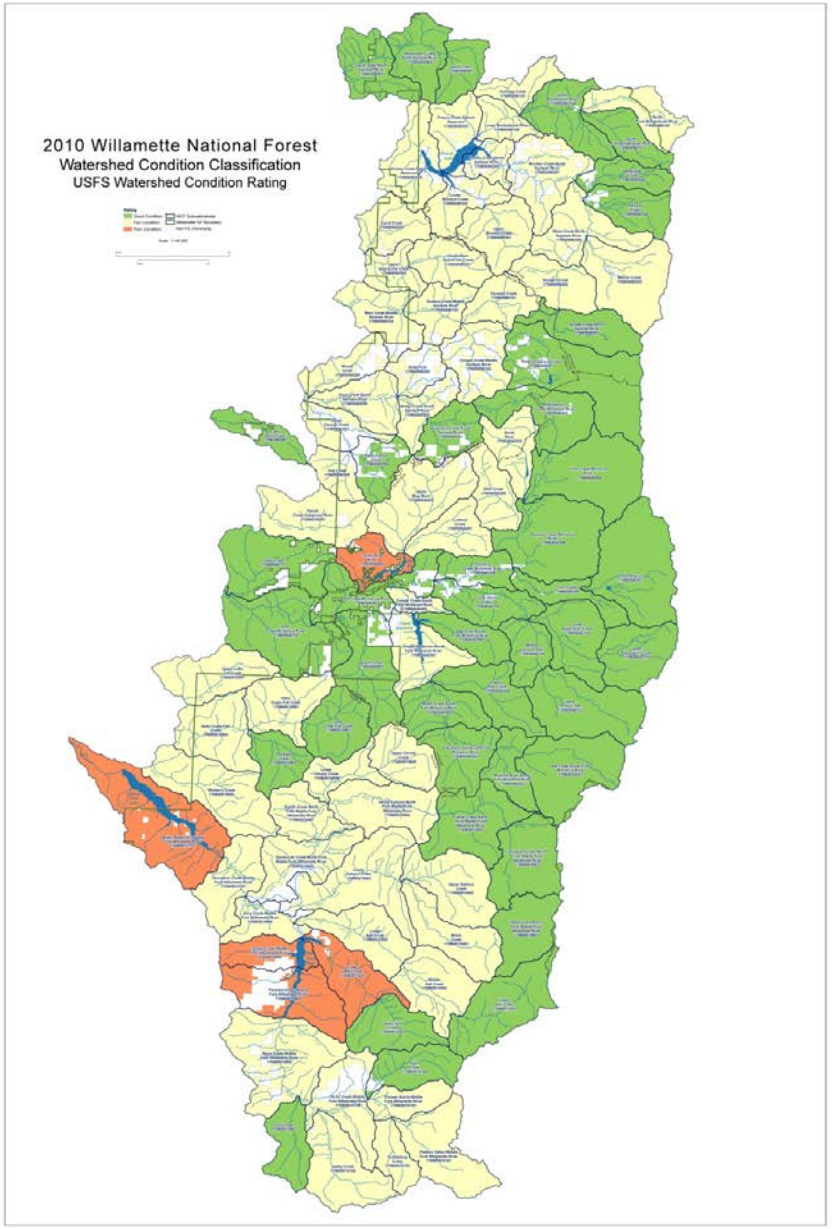
Overlay the Watershed Condition Framework

A core set of 12 national watershed condition indicators.

- **Professional judgment**
- Existing information
- GIS data

How will WCF Results be Used?

- Show changes (hopefully improvement ☺) in watershed conditions over time.
- Develop restoration priorities at a broad Forest level (most useful at the indicator or attribute scale).
- Communicate and integrate our restoration priorities and strategies with partners.



Green = Class 1 (Properly Functioning)
Yellow = Class 2 (Functioning at Risk)
Orange = Class 3 (Impaired Function)

Open Road Density

WCF Standards

Open road density calculations were based on open system roads from all jurisdictions, (i.e., FS, State, County, private, etc.). Use operational maintenance level 2-5 roads. Use the following thresholds

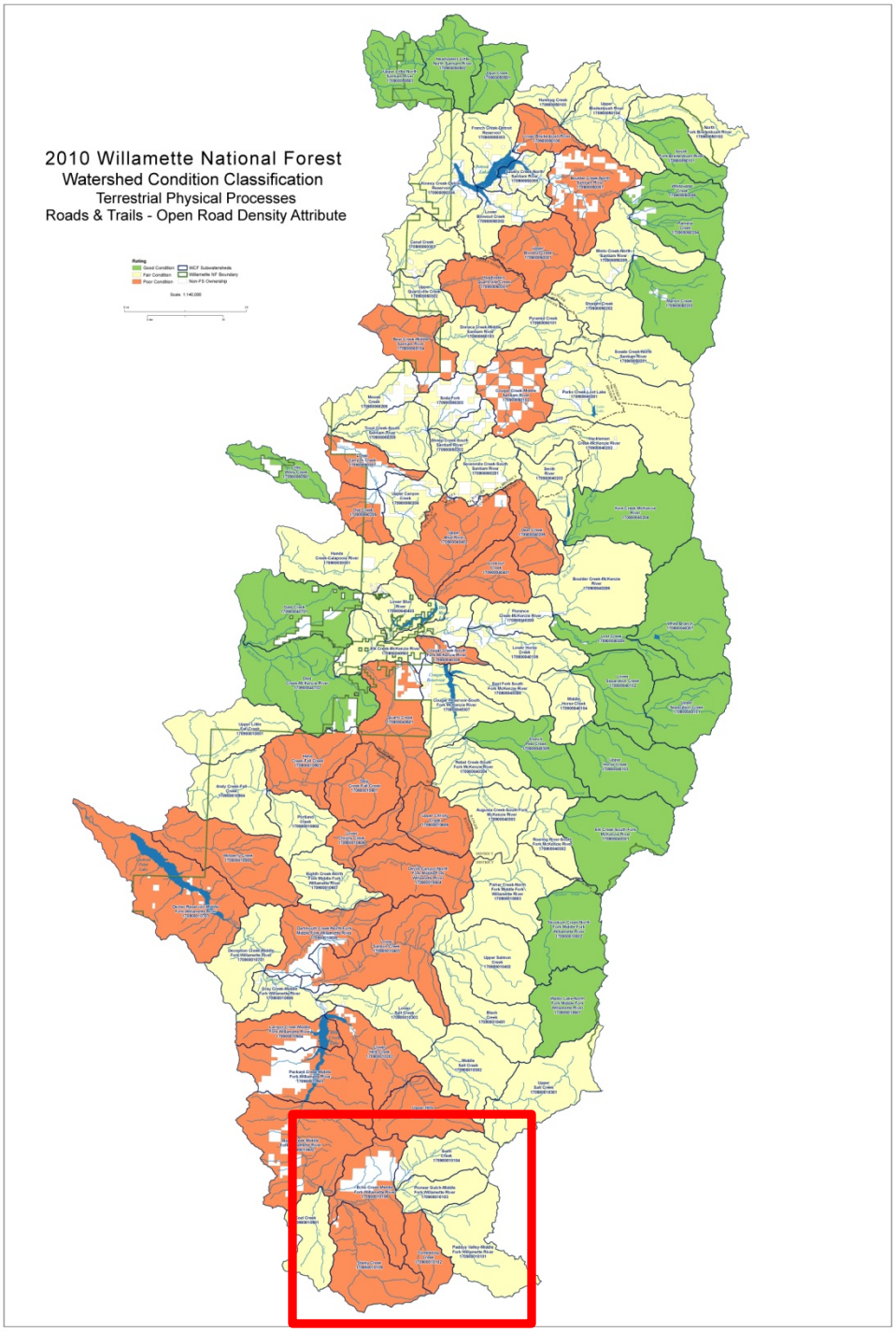
Good(1): Road density of < 1 mi/mi^2

Fair(2): Road density of 1 to 2.4 mi/mi^2

Poor(3): Road density of > 2.4 mi/mi^2

Projects:

Road storage and decommission



State of the Nation's Ecosystem

US Heinz Center Work

The Indicators at a Glance

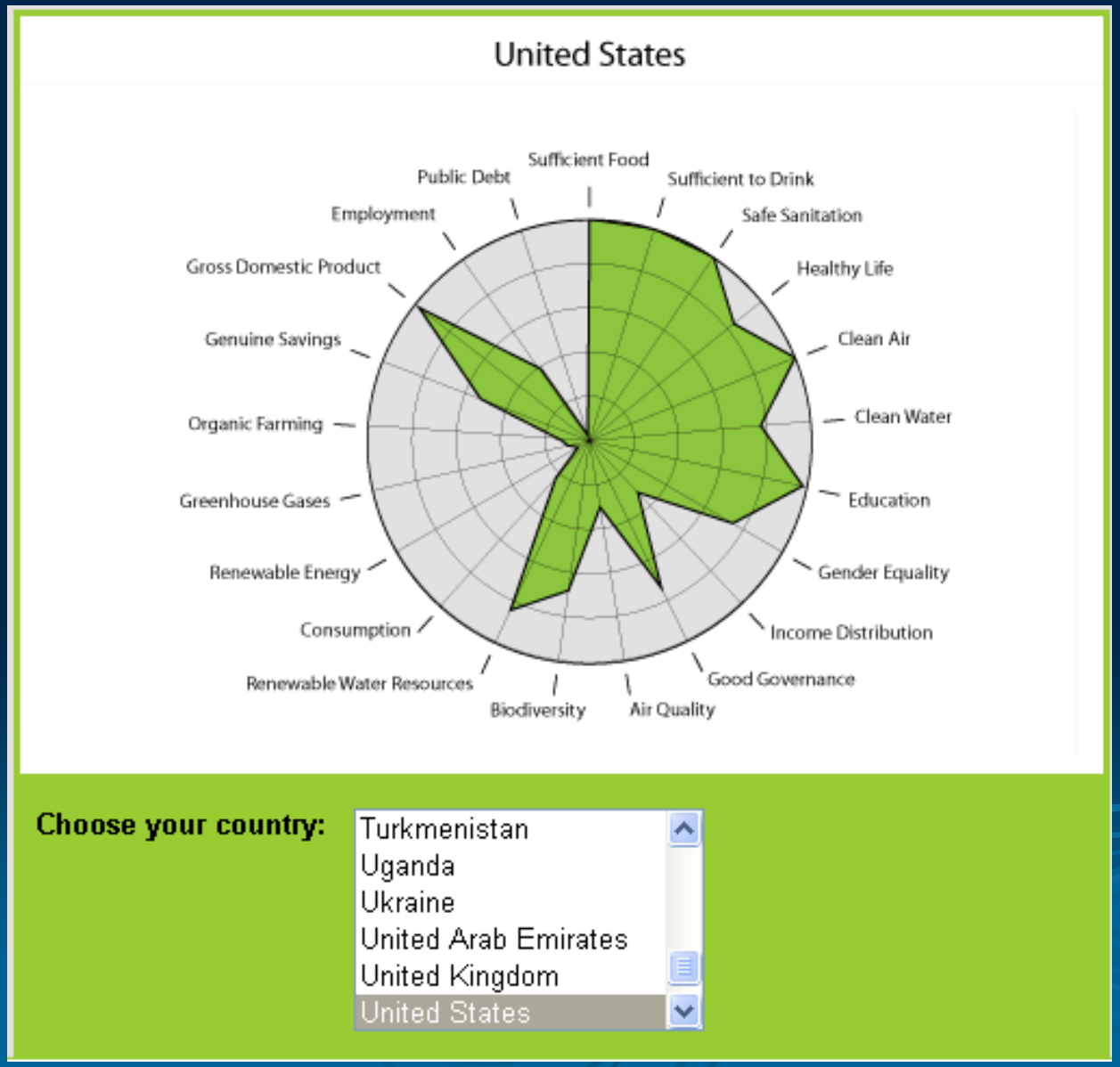
	Core National Indicators	Coasts and Oceans	Farmlands
EXTENT AND PATTERN			
Extent	• Ecosystem Extent*	• Coastal Living Habitats • Shoreline Types	• Total Cropland* • The Farmland Landscape*
Pattern	• Pattern of "Natural" Landscapes†	• Pattern in Coastal Areas†	• Proximity of Cropland to Residences† • Patches of "Natural" Land in the Farmland Landscape†
CHEMICAL AND PHYSICAL CHARACTERISTICS			
Nutrients, Carbon, and Oxygen	• Movement of Nitrogen* • Carbon Storage†	• Areas with Depleted Oxygen*	• Nitrate in Farmland Streams and Groundwater* • Phosphorus in Farmland Streams* • Soil Organic Matter*
Chemical Contamination	• Chemical Contamination*	• Contamination in Bottom Sediments*	• Pesticides in Farmland Streams and Groundwater*
Physical	• Change in Stream Flows†	• Coastal Erosion • Sea Surface Temperature*	• Potential Soil Erosion • Soil Salinity • Stream Habitat Quality†
BIOLOGICAL COMPONENTS			
Plants and Animals	• At-Risk Native Species* • Established Non-native Species†	• At-Risk Native Marine Species • Established Non-native Species in Major Estuaries* • Unusual Marine Mortalities	• Status of Animal Species in Farmland Areas • Established Non-native Plant Cover in the Farmland Landscape†
Communities	• Native Species Composition*	• Harmful Algal Events* • Condition of Bottom-Dwelling Animals	• Soil Biological Condition
Ecological Productivity	• Plant Growth Index*	• Chlorophyll Concentrations*	
GOODS AND SERVICES			
Food, Fiber, and Water	• Production of Food and Fiber and Water Withdrawals	• Commercial Fish and Shellfish Landings • Status of Commercially Important Fish Stocks* • Selected Contaminants in Fish and Shellfish	• Major Crop Yields • Agricultural Inputs and Outputs* • Monetary Value of Agricultural Production
Recreation and Other Services	• Outdoor Recreation • Natural Ecosystem Services*	• Recreational Water Quality	• Recreation in Farmland Areas

* Indicator refined since the 2002 State of the Nation's Ecosystems Report (original metric or metrics retained)
† Indicator redesigned since the 2002 State of the Nation's Ecosystems Report
# New indicator since the 2002 State of the Nation's Ecosystems Report

	Forests	Fresh Waters	Grasslands and Shrublands	Urban and Suburban Landscapes
	• Forest Area and Ownership* • Forest Types* • Forest Management Categories*	• Extent of Freshwater Ecosystems* • Altered Freshwater Ecosystems*	• Area of Grasslands and Shrublands* • Land Use in Grasslands and Shrublands	• Area and Composition of the Urban and Suburban Landscape* • Total Impervious Area
	• Pattern of Forest Landscapes†	• In-Stream Connectivity†	• Pattern of Grassland and Shrubland Landscapes†	• Streambank Vegetation • Housing Density Changes in Low-Density Suburban and Rural Areas† • "Natural" Lands in the Urban and Suburban Landscape†
	• Nitrate in Forest Streams* • Carbon Storage*	• Phosphorus in Lakes, Reservoirs and Large Rivers*	• Nitrate in Grassland and Shrubland Groundwater • Carbon Storage	• Nitrate in Urban and Suburban Streams* • Phosphorus in Urban and Suburban Streams*
		• Freshwater Acidity†		• Urban and Suburban Air Quality* • Chemical Contamination*
		• Water Clarity • Stream Habitat Quality†	• Number and Duration of Dry Periods in Grassland and Shrubland Streams and Rivers* • Depth to Shallow Groundwater	• Urban Heat Island
	• At-Risk Native Forest Species* • Established Non-native Plant Cover in Forests	• At-Risk Native Freshwater Species* • Established Non-native Freshwater Species* • Animal Deaths and Deformities	• At-Risk Native Grassland and Shrubland Species* • Established Non-native Grassland and Shrubland Plant Cover* • Population Trends in Invasive and Non-Invasive Birds	• Species Status • Disruptive Species
	• Forest Age* • Forest Disturbance: Fire, Insects, and Disease* • Fire Frequency • Forest Community Types with Significantly Reduced Area	• Status of Freshwater Animal Communities* • At-Risk Freshwater Plant Communities*	• Fire Frequency • Riparian Condition	• Status of Animal Communities in Urban and Suburban Streams
	• Timber Harvest* • Timber Growth and Harvest*	• Water Withdrawals • Groundwater Levels • Waterborne Human Disease Outbreaks	• Cattle Grazing	
	• Recreation in Forests	• Freshwater Recreational Activities	• Recreation on Grasslands and Shrublands	• Publicly Accessible Open Space per Resident • Natural Ecosystem Services*

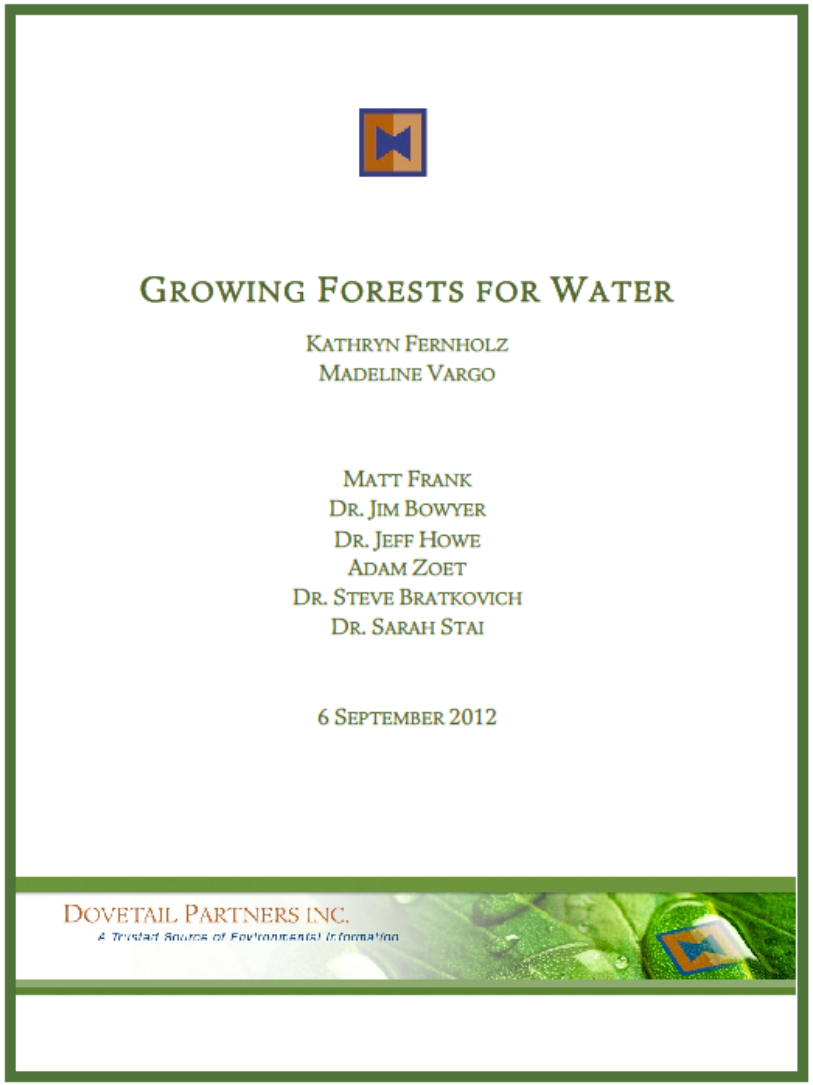
Sustainable Society Foundation

www.ssfindex.com



Growing Forests for Water

DoveTail Partners, Inc.



GROWING FORESTS FOR WATER

KATHRYN FERNHOLZ
MADELINE VARGO

MATT FRANK
DR. JIM BOWYER
DR. JEFF HOWE
ADAM ZOET
DR. STEVE BRATKOVICH
DR. SARAH STAI

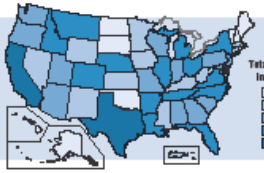
6 SEPTEMBER 2012

DOVETAIL PARTNERS INC.
A Trusted Source of Environmental Information

Fact Sheets

USGS
science for a changing world

Summary of Estimated Water Use in the United States in 2005



- Total withdrawals were 410,000 million gallons per day
- Freshwater withdrawals were 85 percent of the total
- Surface water supplied 80 percent of all withdrawals
- Thermoelectric-power withdrawals were 201,000 million gallons per day

About 410,000 million gallons per day (Mgal/d) of water was withdrawn for use in the United States during 2005. About 80 percent of the total (328,000 Mgal/d) withdrawal was from surface water, and about 82 percent of the surface water withdrawn was freshwater. The remaining 20 percent (82,600 Mgal/d) was withdrawn from groundwater, of which about 96 percent was freshwater. If withdrawals for thermoelectric power in 2005 are excluded, withdrawals were 210,000 Mgal/d, of which 129,000 Mgal/d (62 percent) was supplied by surface water and 80,700 Mgal/d (38 percent) was supplied by groundwater.

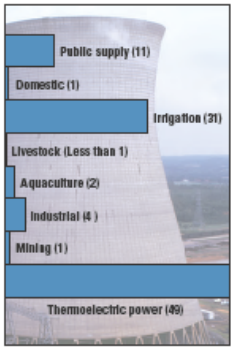
Water withdrawals in four States—California, Texas, Idaho, and Florida—accounted for more than one-fourth of all fresh and saline water withdrawn in the United States in 2005. More than half (53 percent) of the total withdrawals of 45,700 Mgal/d in California were for irrigation, and 28 percent were for thermoelectric power. Most of the withdrawals in Texas (26,700 Mgal/d) were for thermoelectric power (43 percent) and irrigation (29 percent). Irrigation accounted for 85 percent of the 19,500 Mgal/d of water withdrawn in Idaho, and thermoelectric power accounted for 66 percent of the 18,300 Mgal/d withdrawn in Florida.

Water Use by Category

During 2005, about 44,200 Mgal/d of freshwater was withdrawn for **public supply**, which accounted for about 11 percent of the total water withdrawn. About 67 percent of the freshwater withdrawals were from surface-water sources. Public suppliers deliver water to users for domestic, industrial, commercial, and other purposes. **Domestic** use includes indoor and outdoor residential uses, such as drinking water, sanitation, and lawn watering. About 58 percent of public-supply withdrawals, or 25,600 Mgal/d, was for domestic use. Some residences, especially in rural areas, are not connected to public-supply systems, and water for domestic use is self-supplied from wells or other private sources. Self-supplied domestic withdrawals were 3,830 Mgal/d during 2005, which provided water for about 42.9 million people, or 14 percent of the U.S. population. Nearly all of the water withdrawals for self-supplied domestic use were from groundwater.

Withdrawals for **irrigation** totaled 128,000 Mgal/d, second only to total withdrawals for thermoelectric power, and represented 31 percent of total withdrawals and 37 percent of freshwater withdrawals. Irrigation includes water applied by irrigation systems used in agricultural and horticultural practices. Sprinkler systems were used on about half of the irrigated acreage nationwide in 2005, and surface water supplied about 58 percent of the total irrigation withdrawals. Of the total irrigation in the United States, 85 percent of the withdrawals and 74 percent of the acres irrigated were in 17 conterminous Western States.

Combined withdrawals for livestock and aquaculture were less than 3 percent of the total water withdrawals in 2005. **Livestock** withdrawals include water for livestock, feedlots, and dairy operations, and accounted for 2,140 Mgal/d, most of which (60 percent) was supplied by groundwater. **Aquaculture** includes fish farms and fish hatcheries and accounted for 8,780 Mgal/d of freshwater withdrawals, about 78 percent of which were supplied by surface water.



2005 withdrawals by category, in percent

Self-supplied **industrial** withdrawals were an estimated 18,200 Mgal/d, about 4 percent of total withdrawals. Industrial water use includes water used in manufacturing and producing commodities, such as food, paper, chemicals, refined petroleum, wood products, and primary metals. Although some water for industrial uses was delivered by public suppliers, this amount was not estimated for 2005. Surface water was the source for 83 percent of self-supplied industrial withdrawals. Less than 7 percent of total industrial withdrawals were saline water, and 97 percent of the saline water used was surface water.

U.S. Department of the Interior
U.S. Geological Survey

Printed on recycled paper

Fact Sheet 2009-3098
October 2009

Fact Sheet
Yale Environmental Performance Index

Indicator: Access to Sanitation

Objective / Policy: Environmental Health - Water

Code: *ACSAT*

Description: Access to adequate sanitation measures the percentage of a country's population that has access to an improved source of sanitation. "Improved" sanitation technologies are: connection to a public sewer, connection to septic system, pour-flush latrine, simple pit latrine, ventilated improved pit latrine. The excreta disposal system is considered adequate if it is private or shared (but not public) and if hygienically separates human excreta from human contact. "Not improved" are: service or bucket latrines (where excreta are manually removed), public latrines, latrines with an open pit. The total population of a country may comprise either all usual residents of the country (de jure population) or all persons present in the country (de facto population) at the time of the census. For purposes of international comparisons, the de facto definition is recommended. Source: United Nations. Multilingual Demographic Dictionary, English Section. Department of Economic and Social Affairs, Population Studies, No. 29 (United Nations publication, Sales No. E.58.XIII.4).

Rationale: Access to adequate sanitation is not only a public health concern, but also a threat to the environment in countries where human waste is not adequately disposed of or treated.

SOURCE(S)

Variable: Access to sanitation
Citation: WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation
Year of publication: 2011
Covered time: 1990-2005 (5 year values), 2008
URL: http://www.wssinfo.org/data-estimates/table/
Date data obtained: 8/23/2011
Data type: tabular

INDICATOR SUMMARY

Unit of Measurement: Percentage

Indicator creation method:
The indicator is computed as the number of people using improved sanitation facilities in relation to the total population, expressed as a percentage. Estimates are based on data from nationally representative household surveys and national censuses, which in some cases are adjusted by the Joint Monitoring Program to improve comparability among data over time.

Additional notes:
0 values are not actually 0 according to our evaluation of the data; so all 0 cells are treated as missing data and displayed with -8888. The countries not included in WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation list are coded with -9999. Taiwan's data are provided from Taiwan's Ministry of Environment. For countries with at least 2 data points, the data were imputed based on linear interpolation (between the first and last data point). All other missing are coded as following: -8888 for countries with published data, and -9999 for countries not included in WHO/UNICEF data. Data for Lithuania and Brunei were imputed based on regional averages. Singapore's data came from the World Bank's World Development Indicators (WDI) database.

Transformation needed for aggregation: Inverse, logarithmic

Target: 100
Low Performance Benchmark: 13
Source: Millennium Development Goals. The low performance benchmark is based on the 5th percentile of the data time series.

Fact Sheets

Criterion 6. Maintenance and Enhancement of Long-Term Multiple Socioeconomic Benefits To Meet the Needs of Societies

Indicator 6.27.

Revenue From Forest-Based Environmental Services

What is the indicator and why is it important?

Although many studies estimate the value of environmental services to society, this indicator focuses on how much society is actually paying landowners for those services. These payments represent the financial incentives landowners actually face in managing their lands to enhance environmental services. Therefore, tracking the actual payments to landowners is essential for designing effective policies for environmental service production, improving forest policy and management decisionmaking, and for assessing the overall contribution of forests to economies and well-being. Note, however, that the results presented here are simply a measure of the amount of revenues landowners actually receive for producing environmental services rather than a measure of underlying values.

What does the indicator show?

The results presented here reflect incentive payments from Federal and State agencies, payments by developers to private wetland mitigation and conservation banks, sales of carbon offsets produced on U.S. forest lands in the voluntary carbon market, purchases of conservation easements by nongovernmental organizations, and payments for leases and entrance fees to hunt and view wildlife on private forest lands. Data were not available for Federal, State, and local tax incentives; water quality trading and watershed source protection; price premiums paid by consumers for sustainable harvested timber and wood products; and incentive payments by forest industry or forest professional associations. Therefore, these results should be considered a lower bound.

Payments for forest-based ecosystem services to U.S. landowners from all sources for which data are available totaled $1.9 billion in 2007, with private sources accounting for $1.5 billion (81 percent) and government agencies providing $366 million (19 percent) (table 27-1). In 2007, sales of forest wetland mitigation credits amounted to $727 million, conservation bank credits were $34 million, sales of carbon offsets were $1.7 million, conservation easements were $315 million, hunting leases and entrance fees were $410 million, and wildlife viewing entrance fees were $34 million. Wetland mitigation accounted for the largest percentage of forest-based ecosystem service payments, with 39 percent of all payments in 2007. These payments were received by only about 173 private forest mitigation banks, however, accounting for only a miniscule proportion of all private forest landowners in the United States. Hunting leases and entrance fees represented about 22 percent of all payments, conservation easements were 17 percent, wildlife viewing and conservation banks each accounted for 1.8 percent, and carbon offsets were 0.001 percent of all forest-based payments for environmental services in 2007.

Table 27-1. Total payments for environmental services by source (in thousands of constant 2006 dollars).

Payor	2005	2006	2007
Government payments	378	381	366
Wetland mitigation banks	727	727	727
Hunting leases and entrance fees	405	405	410
Conservation easements	162	195	315
Conservation banks	34	34	34
Wildlife viewing	31	32	34
Carbon offsets	0.6	1.6	1.7
	1,737	1,775	1,887

What has changed since 2003?

This indicator is new for 2008 and, therefore, was not reported in 2003. We, however, report changes in payments for environmental services from 2005 to 2007. Figure 27-1 shows the change in payments made to landowners by category from 2005 to 2007. Available data for wetlands mitigation and conservation banking did not allow calculation of annual changes; average values were used for all 3 years. Government payments increased from $378 million in 2005 to $380 million in 2006, but then fell to $365 million in 2007, resulting in an average annual decline of 1.6 percent. In contrast, payments by nongovernment sources grew from $1.6 billion in 2005 to $1.8 billion in 2007. Estimated payments for forest carbon offsets increased by an average of 99 percent annually, conservation easements were 47 percent, and hunting and wildlife viewing revenues were 5 percent, between 2005 and 2007.

The State of the Chesapeake Bay

Chapter 3: The Importance of Forests as Habitat

Chapter 3:

The Importance of Forests as Habitat

KEY FINDINGS

- The Chesapeake Bay watershed has some of the most biologically diverse forests in the nation.
- Forests are more homogenous in age, size, and composition than at any other time over the past several thousand years, resulting in major shifts in forest habitats.
- More than 99% of the pre-settlement eastern deciduous old-growth forest ecosystem is gone.
- Forest loss and fragmentation have left only 40% of Chesapeake forests capable of producing enough habitat to support healthy populations of interior forest-dwelling species.
- Oaks are the most voluminous and ecologically important trees in today's Chesapeake forests, but in many places, the number of oak seedlings and saplings are insufficient to replace the existing forest.
- Red maple is becoming the most dominant species in Chesapeake forests, replacing tree species with greater habitat value.
- Deer populations are out of balance, making deer a key factor impacting forest health and sustainability.
- Invasive forest pests and plants have permanently altered the native biodiversity of Chesapeake forests and the habitats they provide. The continued introduction of new pests is a serious concern that could have significant consequences.
- Over 6 million acres or 45% of the Bay watershed's network of forests and wetlands is vulnerable to development.

QUESTIONS?

&

DISCUSSION

How can this apply to the MPC&I ?