Use of Indicators for National Watershed Assessments

The Sustainable Water Resources Roundtable

April 27, 2011

Vision for the Forest Service

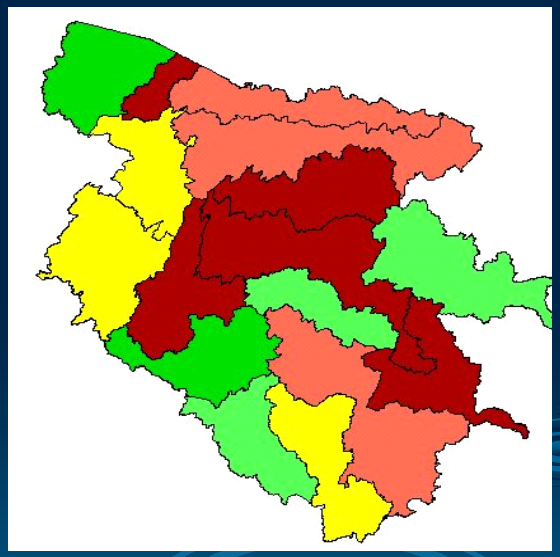
USDA will use the restoration of watershed and forest health as a core management objective of the National Forests and Grasslands.

USDA Strategic Plan for FY 2010 – 2015

Implementing the Vision: Watershed Condition Framework

USDA Forest Service

April 27, 2011



Watershed Condition Framework

STEP A
Classify Watershed Condition

STEP B
Prioritize Watersheds for Restoration

STEP C
Develop Watershed Action Plans

STEP D
Implement Integrated Projects

STEP E
Track Restoration Accomplishments

STEP F
Monitor and Verification

Watershed Condition Framework

- A consistent, comparable and credible approach approach for pro-actively implementing integrated restoration on priority watersheds on National Forests and Grasslands

- Provides the Forest Service with an outcome-based performance measure for documenting improvement to watershed condition at Forest, Regional, and National scales

Objectives

- Establish a systematic process for determining Watershed Condition Class
- Improve Forest Service reporting and tracking of watershed condition
- Strengthen the effectiveness of Forest Service watersheds restoration
- Enable a priority-based approach for the allocation of resources for restoration
- Enhance coordination with external agencies and partners

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 Framework

- Step A – Watershed Classification

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

Rating Approach

- Each indicator attribute receives a rating
  - **Attribute Condition Rating 1 -** "functioning properly"
  - **Attribute Condition Rating 2 -** "functioning at risk"
  - **Attribute Condition Rating 3 -** "impaired"

Rating Non-NFS Lands

Non-FS Lands:

- We frequently lack data about non-FS lands
- Individual Indicators/Attributes not rated
- Use a subjective rating based on all non-FS land
  - *Same condition as FS Land*
  - *Better condition than FS Land*
  - *Poorer condition than FS Land*
- When in doubt - rate “Same As”
- Composite Watershed Condition Score: Area-weighted

1. Water Quality

1. Impaired Waters (303d Listed)
   - Thresholds for impaired waters in watershed
2. Water Quality (No 303d listed waterbodies)
   - Mines
   - Sediment, nutrients, chemical pollution, consumption advisories, groundwater-related issues
   - Atmospheric deposition

2. Water Quantity

Flow Characteristics

- Departure from natural hydrographs primarily due to dams or diversions
  - 1 – No or minor departure
  - 2 – Moderate departure
  - 3 – Significant departure
- Does not address changes from vegetation *unless* changes are:
  - Extensive
  - Persistent

3. Aquatic Habitat

1. Habitat Fragmentation (including AOP)
2. Large Woody Debris (LWD)
3. Channel Shape and Function
   - **Additional Guidance:**
     - Use Forest Plan thresholds if they exist
     - Rate LWD “Not Applicable” if presence of wood is not an important process

4. Aquatic Biota

1. Expected Aquatic Life Form Presence
2. Expected Native Species Presence
3. Presence of Exotic and/or Aquatic Invasive Species

- Additional Guidance:
  - Avoid focus on single species; focus on communities
  - Widespread presence of exotic and/or aquatic invasive species indicates poor conditions

5. Riparian/Wetland Vegetation

Riparian Vegetation Condition

- Native vegetation in properly functioning condition
  - Structure
  - Cover
  - Composition

Additional Guidance:

- Use Forest Plan thresholds if they exist
- Use PFC field surveys if available

6. Roads & Trails

1. Open Road Density (mi / sqmi)
2. Road and Trail Maintenance - BMPs
3. Encroaching or Riparian Roads / Trails
4. Mass Wasting

- Additional Guidance:
  - Forests may substitute local analysis or Forest Plan thresholds
  - Rate mass wasting “Not Applicable” if it is not a significant process

Criteria author: Paul T. Anderson

7. Soil Condition

1. Soil Productivity
2. Soil Erosion
3. Soil Contamination
   - Additional Guidance:
     - Use Forest Plan thresholds if they exist
     - Atmospheric Deposition: Current information for site-specific, regional and national scale critical loads is available at www.fs.fed.us/air

Criteria authors: Penny Luehring, Cindy Huber

8. Fire Effects and Regime

Fire Regime Condition – FRCC (PNV)

>>> OR <<<

Wildfire Effects – Extent of Damage

Additional Guidance:

- Fire Regime Condition: While the use of national FRCC map products is encouraged, Forests may refine FRCC as appropriate to fit their local situations

Criteria authors: Jaelith Hall-Rivera, Penny Luehring

9. Forest Cover

Forest Cover – NFMA requirements

Presence / absence of forest cover

Cutover, denuded, or deforested land

Additional Guidance:

- Private and other ownerships are not included in the rating
- May be rated “Not Applicable” if forest cover is absent in the watershed. If Forest Cover is rated N/A, Rangeland Condition must be rated

10. Rangeland Vegetation

Rangeland Vegetation Condition

- Native / desirable non-native plant composition

Additional Guidance:

- Use Forest Plan thresholds for ecological condition if they exist
- If rated “Not Applicable” Forest Cover must be rated
- Use guidance and definitions found in Interpreting Indicators of Rangeland Health (Pellant et al. 2005) to assist with this evaluation

11. Terrestrial Invasive Species

Terrestrial Invasive Species Condition

- Few (<10%), or no, populations of terrestrial invasive species infest the watershed
- Populations of terrestrial invasive species are established within (10%-25%) the watershed
- Populations of terrestrial invasive species infest significant portions (>25%) of the watershed

12. Forest Health (p. 66)

1. Insects & Disease
2. Ozone damage

Additional Guidance:

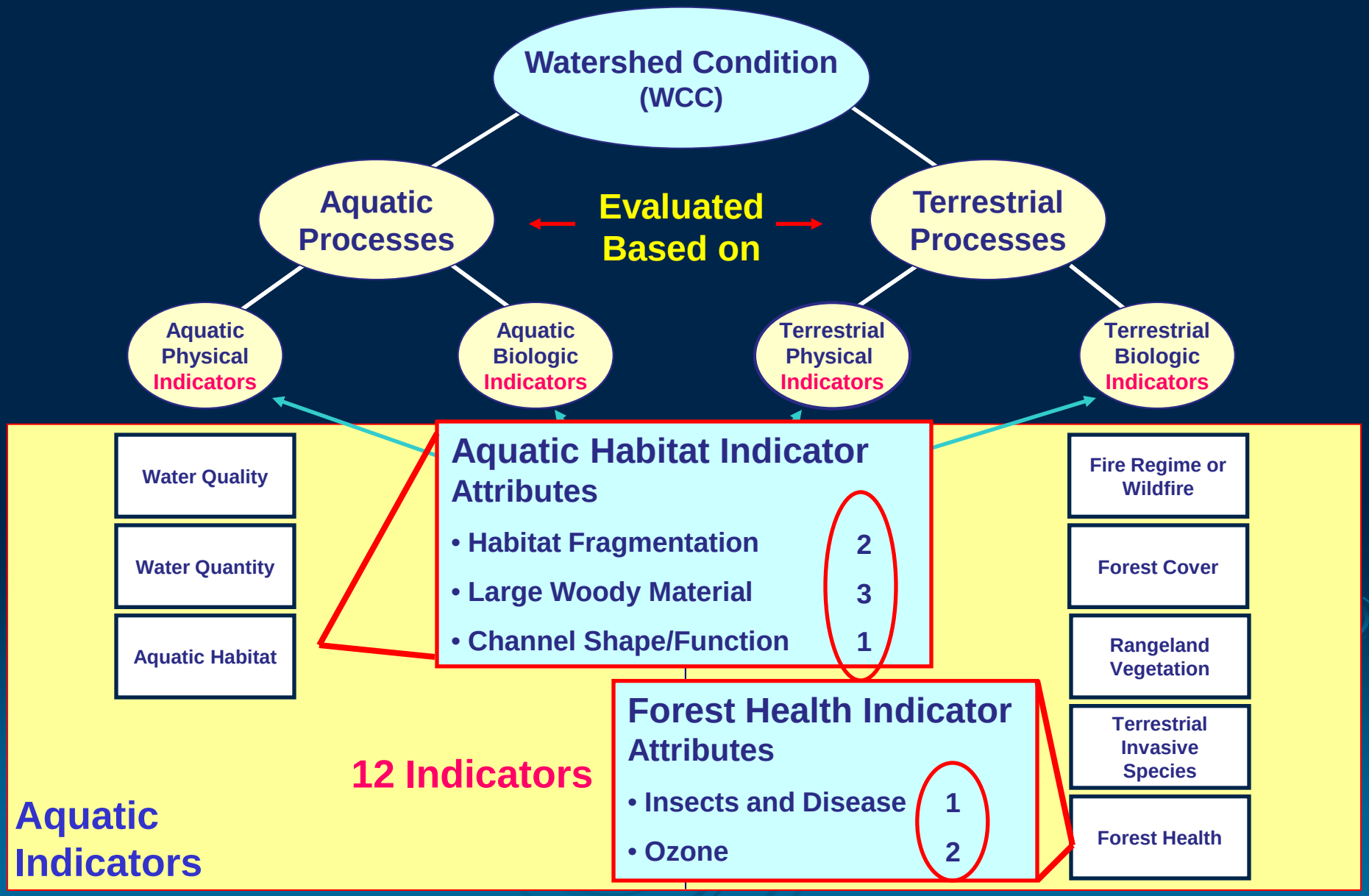
- Use the 2006 National Insect and Disease Risk Map (Krist et al. 2007) as a beginning point
- Finer scale 6th level HUCs maps are available from the Forest Health Technology Enterprise Team (FHTET)
- Contact your local Air Specialist or Forest Health Specialist for assistance with ozone analysis

Criteria authors: Borys Tkacz, Cindy Huber

Watershed Scoring

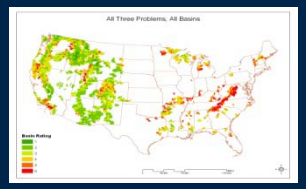
- For each 6th level HUC watershed, all attributes for each of the 12 indicators is scored by the Forest interdisciplinary team.
- The attribute scores for each indicator are summed and averaged to produce an indicator score.
- The indicator scores within each of the four ecosystem process categories are then averaged to arrive at a process category score.
- The overall Watershed Condition Score is computed as a weighted averaged of the four process category scores.
- The Watershed Condition scores are tracked to one decimal point and reported as Watershed Condition Classes 1, 2, or 3. Class 1 = scores of 1.0 to 1.66; Class 2 = scores >1.66 and <2.33, and Class 3 = scores from 2.33 to 3.0.
- A separate scoring process is conducted for FS and non-FS lands within the watershed. Results will be reported for FS and non-FS lands and a watershed composite overall Watershed Condition Score (area weighted average of FS and non-FS lands).

The Basic Watershed Model



Basic Watershed Model

Phase 1



Watershed Condition (WCC)

Aquatic Processes ← **Evaluated Based on** → **Terrestrial Processes**

Aquatic Physical Indicators

- Water Quality
- Water Quantity
- Stream & Habitat

Water Quality Indicator Attributes

• Impaired Water Bodies	2
• Consumption Advisories	3
• Active/Abandoned Mines	1
• Water Supply Treatment	1
• Atmospheric Deposition	2

Terrestrial Biologic Indicators

- Fire Regime
- Forest Cover
- Range & Open Areas
- Terrestrial NNIS
- Insects & Disease

Forest Specialists:

- ✓ Update Phase 1
  - Score Attributes
  - Criteria/Guidelines
- ✓ Update Model

Aquatic Indicators

Terrestrial Indicators

Watershed Condition Classes

Outcome Measures (?)

- # Class 1 Watersheds
- # Class 2 Watersheds
- # Class 3 Watersheds

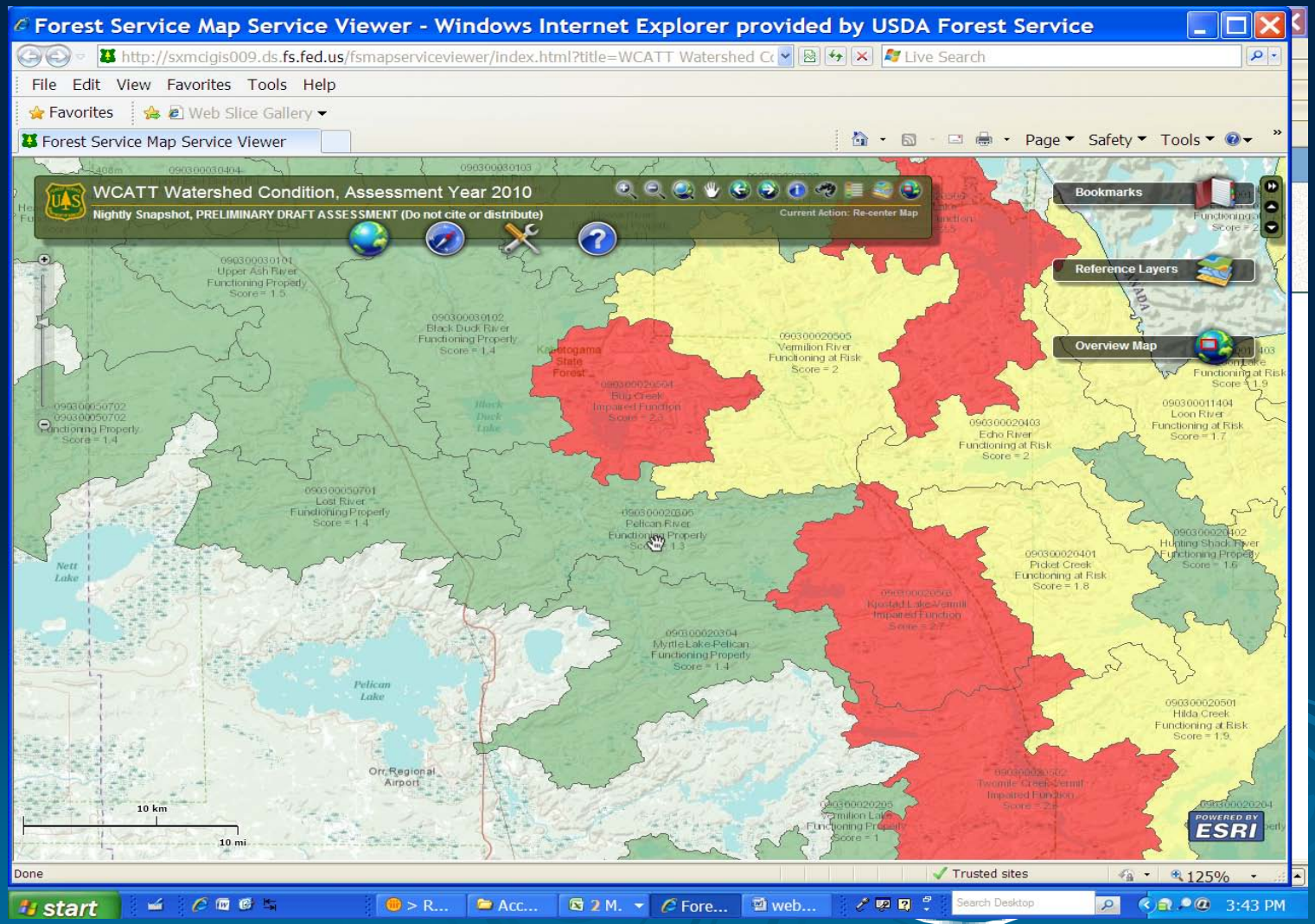
Or

Watershed Condition Score

(weighted average process scores)

Web Map of Condition Class - All NFS Watersheds

Capability to Drill Down



Next Steps

- Step B (prioritization) and Step C (action plans) completed for small percentage of priority watersheds by end of FY 2011.
- Concurrently developing complementary terrestrial integrity assessment.
- FY 2012 continue implementing Steps B and C for greater number of watersheds and begin implementation of Step D (implementation of projects)

References

- http://www.fs.fed.us/
- http://www.fs.fed.us/publications/watershed/Watershed_Condition_Framework.pdf
- http://www.fs.fed.us/publications/watershed/watershed_classification_guide.pdf