Policy Primer

WATERSHED CONDITION FRAMEWORK SYNOPSIS AND REVIEW

By Adam Rissien

For years Wildlands CPR has urged the Forest Service to implement policies that focus on restoring whole watersheds in order to improve water quality as well as aquatic and terrestrial habitats. It seems our efforts are paying dividends: the USDA's current strategic plan makes watershed restoration a core objective for the Forest Service. In response the agency created the Watershed Condition Framework (WCF), which fundamentally changes its restoration approach.

The previous agency paradigm was to treat the worst watershed problems through small projects, resulting in scattered, uncoordinated activities that rarely achieved whole watershed restoration. The WCF represents a more holistic approach and a new way to plan and conduct improvement and maintenance projects across entire watersheds rather than in piecemeal fashion. This marks a significant gain, and while certainly not perfect, demonstrates a change in agency priorities that was long overdue.

Overview

The Forest Service describes the WCF as *"a comprehensive approach for classifying watershed condition, proactively implementing integrated restoration in selected watersheds on national forests and grasslands, and tracking and monitoring outcome-based program accomplishments for performance accountability."* (WCF p. 1).

In short, the WCF's goal is to maintain or improve whole watersheds; it does so through a six-step process that classifies current conditions and prioritizes watersheds in need of restoration. It also requires development and implementation of action plans followed by monitoring to determine the plans' effectiveness. The WCF describes each step:

> **Step A:** Classify the condition of all 6th-level watersheds in the national forest by using existing data layers, local knowledge, and professional judgment.
> **Step B:** Prioritize watersheds for restoration: establish a small set of selected watersheds for targeted improvement equivalent to a 5-year program of work.
> **Step C**: Develop watershed restoration action plans that identify comprehensive project-level improvement activities.
> **Step D**: Implement integrated suites of projects in select watersheds.
> **Step E**: Track restoration accomplishments for performance accountability.
> **Step F**: Verify accomplishment of project activities and monitor improvement of watershed and stream conditions. (WCF p. 5)

The WCF is designed to work within existing budgets, use GIS technology with quantitative measures when possible, and focus on factors that have the greatest influence on watershed conditions, [Watershed Condition Class Technical Guide, p. 4 (hereafter: "Tech Guide")]. Ultimately, the WCF's goal is to return areas to a more natural, pristine state with high watershed functionality (e.g. integrity).

It should come as no surprise: wilderness watersheds (like the Selway River) contain the most pristine water in our national forests. Photo by Dan Funsch.

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Watershed Condition Classification

The framework's crux rests upon the first step, which assigns a condition class using a one to three scale, where (1) means the watershed is functioning properly, (2) the watershed is at risk and (3) indicates it is impaired. "The Watershed Condition scores are tracked to one decimal point… 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," (Tech Guide, p.12). These classifications are central to the framework since forest officials need to show success by moving watersheds up to a higher quality condition class.

In determining the classification rankings, the WCF uses four general process categories. Additionally, each category has corresponding indicators with attributes that most influence watershed conditions. The following table shows each category with the percent it is weighted in calculating scores, along with each indicator and its corresponding attributes.

Watershed Condition Indicators - (12 Indicator Model)

Aquatic Physical (weighted 30%)	
Indicator	***Attribute(s)***
Water Quality	Impaired waters (303d listed), Water quality problems (not impaired)
Water Quantity	Flow characteristics
Aquatic Habitat	Habitat fragmentation, Large woody debris, Channel shape & function
Aquatic Biological (weighted 30%)	
Aquatic Biota	Life form presence, Native species, Exotic and/or invasive species
Riparian/Wetland Vegetation	Vegetation condition
Terrestrial Physical (weighted 30%)	
Roads and Trails	Open road density, Road maintenance, Proximity to water, Mass wasting
Soils	Productivity, Erosion, Contamination
Terrestrial Biological (weighted 10%)	
Fire Regime or Wildfire	Wildfire condition class OR Wildfire effects
Forest Cover	Loss of forest cover
Rangeland Vegetation	Vegetation condition
Terrestrial Invasive Species	Extent & rate of spread
Forest Health	Insect & disease, Ozone

(Adapted from the Tech Guide, p. 11)

The Forest Service derives condition class scores by first assigning a 1, 2 or 3 for each attribute based on existing data; officials may decide a specific attribute is not applicable and forego assigning a score. Next, all attributes are added and averaged to derive a score for the corresponding indicator, and then indicator scores for each process category are summed and averaged as well. Finally, each of the four category's scores are averaged together based on their assigned weights. It is important to note that pre-existing data, not new site-specific analysis, is the foundation of this process. Therefore, scores can be adjusted based on professional expertise and judgments.

Next Steps

Looking back at each of the six steps listed above, all national forests have completed Step A (the classification process). Individual forests are currently selecting priority watersheds for improvement or maintenance (Step B) based, in part, on the resulting condition class scores. However, forests can only choose a limited number of priority watersheds since activities must fit within current budget levels and be finished within 5 years (WCF p. 11). Those activities become essential projects in priority watershed action plans that each forest must develop (Step C) to improve condition class scores. Step D involves actually implementing these action plans, which will take several years since projects must still go through appropriate environmental analysis. It would not be unusual to anticipate a 5-year or longer timeframe from analysis through completion. Once projects are finished, the forest will record accomplishments in its internal databases (Step E) to track project completion and changes in watershed condition classes.

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Lastly, in Step F, the WCF proposes a two-tiered approach for verifying and monitoring effectiveness. Tier 1 is performance monitoring — an administrative verification of condition classes to determine if they were properly assigned. This is done by annually reviewing a sample of priority watersheds and associated projects to judge if they can reasonably be expected to improve conditions. Tier 2 addresses effectiveness monitoring — the agency will monitor watersheds in detail to measure improvement on the ground. Both performance and effectiveness monitoring can only take place upon completion of all essential projects in the priority watershed action plan, so it will be some time before verification reports become available.

A non-functional culvert diverts water away from the creek and down a road. Photo by Adam Switalski.

WCF Concerns

While the WCF represents a paradigm shift toward holistic watershed improvement, significant shortcomings still exist. We are most concerned about potential biases, problems with monitoring/tracking, and specific issues related to road/trail density and road/stream interactions.

Biases

Forest officials are under pressure to show results so it's not unreasonable to expect some watersheds will be chosen as priorities for the sake of expediency. For example, the WCF defines five different cost categories, ranging from under $100,000 to over $15 million. Managers must estimate the total cost for improving the watershed, which includes environmental analysis as well as implementation. It is highly likely the agency will prioritize watersheds that require less expensive work, and thus fall into the least expensive categories. Watersheds that require a significant amount of road reclamation or culvert work are not likely to fare well in such a scenario.

Additionally, officials may have a bias because forests are only credited when a watershed moves from one condition class to another (a 3 to 2, or a 2 to 1) even though scores are calculated in decimal points. Some officials may be tempted to choose priority watersheds right on the upper edge of a class score since moving it to an improved condition would be easier. For example, the score for condition class 2 ranges from 1.66 – 2.33, so if a watershed has a 1.72 score it will be easier to move it to a condition class 1 as compared to a score of 2.29.

Tracking success and monitoring

The WCF directs managers to record improvements in condition classes upon completion of all essential projects in the priority watershed action plan. One glaring problem with this approach is that condition classes will move before managers actually verify the project results. *In other words, moving watershed condition classes is a paper exercise based on completing all essential projects from the priority watershed action plan instead of whether or not those projects actually improved watershed conditions.*

It is understandable that the Forest Service would want to demonstrate the WCF's success, but the agency should have a multi-tiered approach both for crediting managers in order to reduce the potential for bias, and to actually track whether watersheds are improving based on effectiveness monitoring. To measure success, managers should get credit at three stages: one for applying project-specific treatments; next for completing all essential projects within a priority watershed action plan; and then for actually moving a watershed condition class after effectiveness monitoring verifies the improved watershed conditions. A watershed should not be moved to a new condition class until actual improvements are verified on the landscape. That said, we recognize that some treatments, including road reclamation, could take years to change water quality measurements like sedimentation.

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Roads/Trails and the WCF

Aside from concerns with how the WCF tracks improvements to condition classes and the potential for bias in choosing priority watersheds, there are problems with specific attributes among key indicators, most notably the roads and trails indicator. For roads and trails, the FS is using four attributes to assess condition: open road density, road maintenance, proximity to water and mass wasting. These attributes have some shortcomings, for example:

- total road density should be listed instead of open road density
- in addition to proximity to water, the agency should be assessing the number/presence of road/stream crossings
- in addition to mass wasting, the agency should be assessing the percent of road miles sited on steep slopes, as all soil types are not at risk of mass wasting, but might still experience significant failures due to slope steepness.

Overall, however, the road/trail attribute is a step in the right direction, and the WCF Condition Classification Technical Guide includes an appendix with additional, helpful guidance. Still, here are examples of how two of these attributes might be problematic.

Road/trail density

Looking at Figure 1, the chart reads "Open Road Density" for the attribute label, yet the description includes "linear features." In fact, additional guidance states, *"for the purposes of this reconnaissance-level assessment, the term "road" is broadly defined to include roads and all linear features on the landscape that typically influence watershed processes and conditions in a manner similar to roads,"* (Tech Guide, p. 43). This section explains that even closed roads (with or without a closure order) should be included if they are still hydrologically connected to the watershed. However it does not allow an on-the-ground assessment to verify this, so a manager would either have to assume that all closed roads are (or are not) hydrologically connected to the stream, or would have to know which specific roads are problematic. Other linear features in the density calculation can include temporary roads and motorized trails. This latter category is especially important given that some forests have renamed hundreds of miles of roads as trails without ever physically treating them to reduce impacts. In addition, many motorized trails function as roads ecologically, even if they were never built to convey cars.

Unfortunately this clarifying guidance is in an appendix, not in the chart that provides the initial overview, thus managers could have included only open, system roads in density calculations rather than all linear features. Since calculations for watershed condition classes are already finished, there is limited opportunity to go back and ensure each forest applied the additional guidance, especially since there was no public review of condition class calculations. This is especially concerning

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Figure 1. Road and Trail Condition

6. Road and Trail Condition Indicator	The density and distribution of roads and linear features within the watershed indicates the hydrologic regime is substantially intact and unaltered.	The density and distribution of roads and linear features within the watershed indicate there is a moderate probability that the hydrologic regime is substantially altered.	The density and distribution of roads and linear features within the watershed indicate there is a higher probability that the hydrologic regime (timing, magnitude, duration, and spatial distribution of runoff flows) is substantially altered.
Attributes	**GOOD (1) Functioning Properly**	**FAIR (2) Functioning at Risk**	**POOR (3) Impaired**
Open Road Density	Default road/trail density: < 1 mi/mi², OR a locally determined threshold for good conditions supported by Forest Plans or analysis and data.	Default road/trail density: 1 - 2.4 mi/mi², OR a locally determined threshold for fair conditions supported by Forest Plans or analysis and data.	Default road/trail density: >2.4 mi/mi², OR a locally determined threshold for poor conditions supported by Forest Plans or analysis and data.

(WCF Condition Class Technical Guide, p. 43)

because the WCF directs that reassessment of condition classes be updated annually, but only for select watersheds that may have shown significant improvement or changes due to a natural event like fire or flood. More comprehensive recalculations for all watershed conditions are supposed to occur every five years, but budget constraints may preclude this. Therefore, faulty calculations that don't give appropriate emphasis to the stress roads cause on aquatic and hydrologic conditions could persist for years.

Proximity to water

While our concerns with the open road density attribute relate to a lack of clarity, more troubling is how the WCF measures the "proximity to water" attribute. For a good score (functioning properly) the WCF directs, "No more than 10% of road/trail length is located within 300 feet of streams and water bodies or hydrologically connected to them," (Tech Guide, p. 43). But this particular language, though perhaps well-intended, could actually work as a disincentive to remove roads or other linear features that are not close to water. Basically, if roads are removed outside of the 300-foot streamside buffer zone to reduce road density, for example, the percent of roads within the buffer zone could increase, which could downgrade the watershed condition.

To explain further, consider the following scenario, as shown in Figure 2: A forest road follows a creek up a watershed and then climbs up a mountainside. One mile of the road (out of ten) is within 300ft of a stream (equaling 10% of the road length). Managers decide to remove 5 miles of roads in the headwaters of the watershed (not within 300ft of the stream) in order to improve the watershed while leaving the lower streamside section of road in place. The WCF calculation now changes to one mile of road out of five that is within 300ft of a stream with the result that now 20% of the road is in proximity to the stream. At 20%, the area is reclassified as functioning at risk - even though the road length was cut in half and there was no further impact to the stream. So while the road density calculation decreased, the percent of road next to the stream increased, effectively canceling the gains made by removing part of the road. To fix this problem and more accurately measure the proximity to water attribute, the WCF should use the percent of ***stream miles*** within 300ft of a road rather than the other way around.

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Figure 2. Proximity to Water Attribute Example

This example of a hypothetical ten-mile road shows how the "proximity of roads to streams" attribute can backfire. As currently defined, the WCF measures the percent of road miles within 300 ft of a stream, instead of the reverse.

1 road mile/10 road miles = 10%

The WCF considers 10% as functioning properly (good)

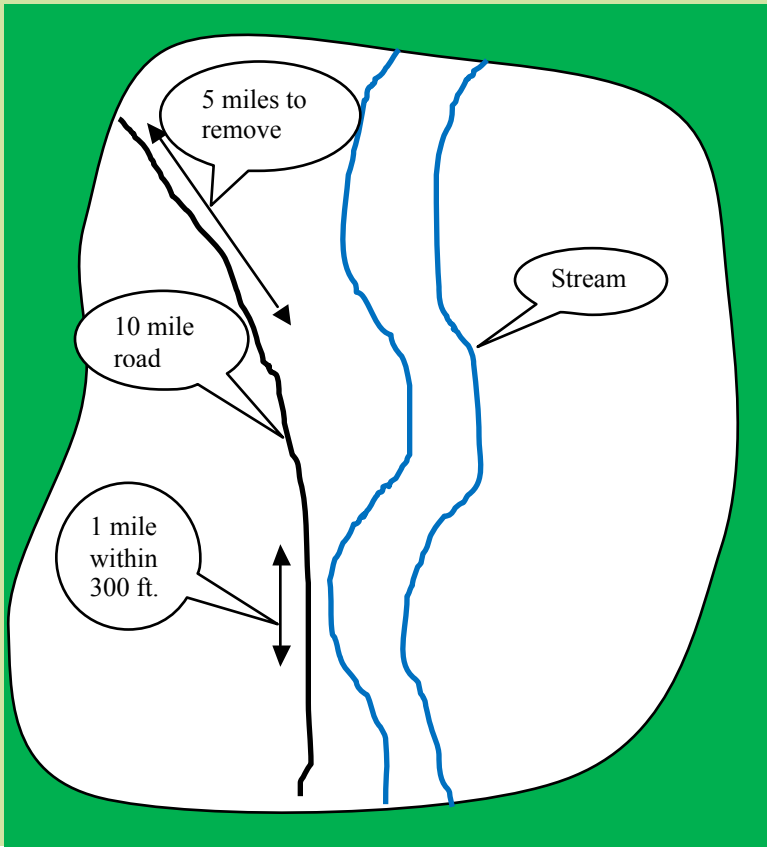
If a project removes 5 miles of road that is not within 300 ft of a stream, then the calculation becomes:

1 road mile /5 road miles = 20%

The WCF considers 20% as functioning at risk (fair)

So, even though the watershed condition was improved by reducing the road density, the percent of the road within 300 ft of the stream *increased*.

To fix this, the attribute should use the percent of stream miles within 300 ft of a road, not percent of road miles within 300 ft of a stream.



Conclusion

The WCF is a huge step in the right direction and shows the Forest Service is planning to walk its talk. Nonetheless, it has several shortcomings that could reduce its effectiveness on the ground. Specifically, it would be helpful if each region could verify that calculations for indicators and attributes were informed by the additional guidance, and class scores adjusted where needed. In addition, while it makes sense to choose watersheds that can realistically be improved, and possibly even to prioritize some watersheds that could reach a high level of function quickly, the prioritization process should not be entirely constrained by budgets and timelines. And on the reporting side, the agency should adopt a multi-tiered approach for documenting accomplishments. Finally, changes to condition classes should be based on the verification of each project's effectiveness in addition to the completion of all essential projects.

Nonetheless, the Forest Service deserves credit not only for creating the WCF but for already implementing the first step and assigning condition classes to all watersheds. Their initial map, unsurprisingly, seems to show that most high quality watersheds are largely situated in roadless and wilderness areas, providing further justification for protected areas. But there are five more steps yet to complete, and with each new phase the agency will come closer to improving watershed health on the forests. According to recent conversations, they should be identifying priority watersheds before September 30. They also want to engage the public in some way in that process, so it would be good to contact your local forest about their process. Overall, the Watershed Condition Framework provides the opportunity to restore whole watersheds, but it will need careful monitoring and adjustments to ensure its success.