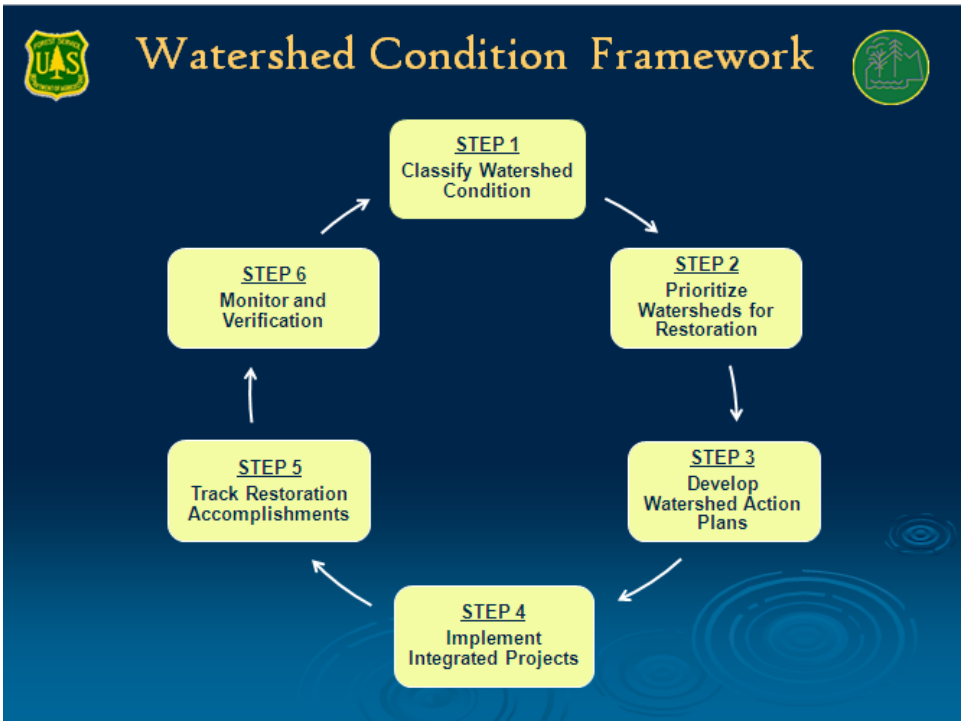
Watershed Condition Framework
Greater Yellowstone Area April 3, 2012

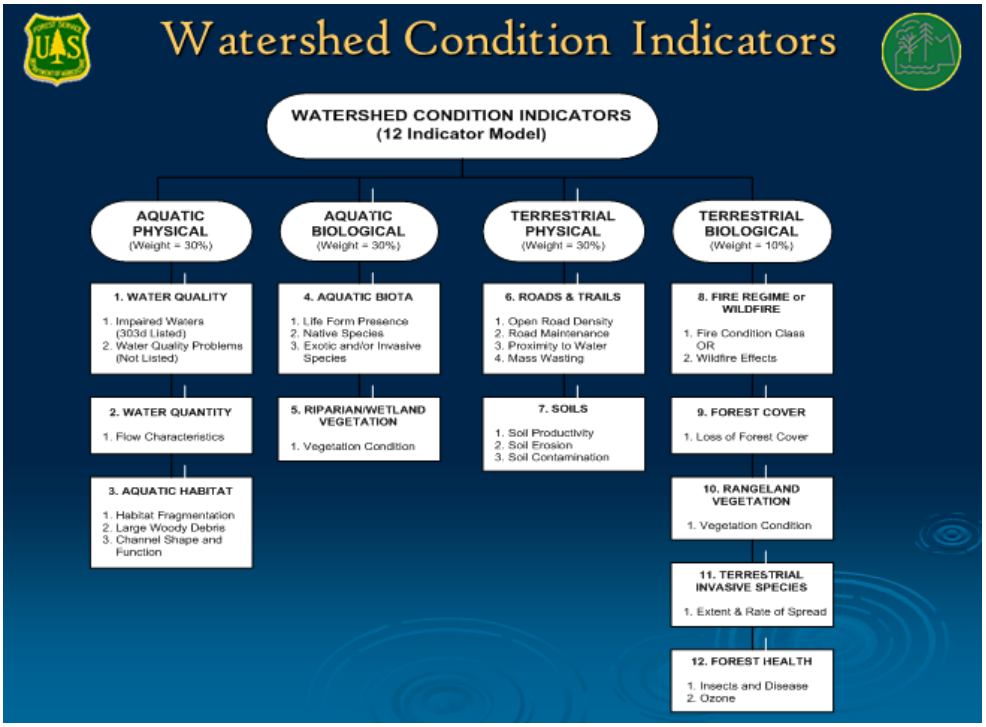
In April 2011 the GYCC authorized development of Watershed Conditon Framework (WCF) ratings for all of the NPS and USFWS lands in the Greater Yellowstone Area (GYA) to be combined with the NFS WCF ratings in order to achieve a composite WCF map and attribute rating tables for most of the GYA. This report summarizes the WCF process and results for Yellowstone NP, Grand Teton NP, National Elk Refuge, Rockefeller Memorial Parkway, and Red Rock Lakes National Wildlife refuge and a composite WCF map for the entire GYA. The reports concludes with potential and recommended GYA WCF activities.

The WCF process was developed by USFS staff over a period of many years and then applied to all National Forests in 2011 (USDA, 2011. Watershed Condition Framework, FS-977). The GYH (Greater Yellowstone Hydrologists) in an updated GYA Watershed Strategic Plan (3/11), proposed to expand the WCF rating process to all of the GYA lands. The WCF consists of 6 steps (shown below) from rating or classifying, prioritizing watersheds for restoration, followed by action plans, project implementation, and tracking and monitoring. The goals of WCF are to use a systematic process for watershed condition ratings, develop watershed action plans, and facilitate funding of restoration projects to improve watershed condition. Extending the process to the NPS and USFWS is intended to enhance overall GYA understanding of watershed conditon and improve funding to improve documented problem areas.



The WCF rating process consists of rating watershed by Hydrologic Unit Code 6 level watersheds (HUC6) which range from about 10,000 to 25,000 acres in size. HUC6 is a common land unit for analysis . The framework has 4 process catergories: aquatic physical, aquatic biological, terestrial physical, and

terrestrial biological which area then organized into 12 indicators and 24 rating attibutes as shown below.



Each HUC6 watershed is then rated for each attribute then a composite scored developed for each watershed. A watershed class is then developed to list each watershed into 1 of 3 classes :

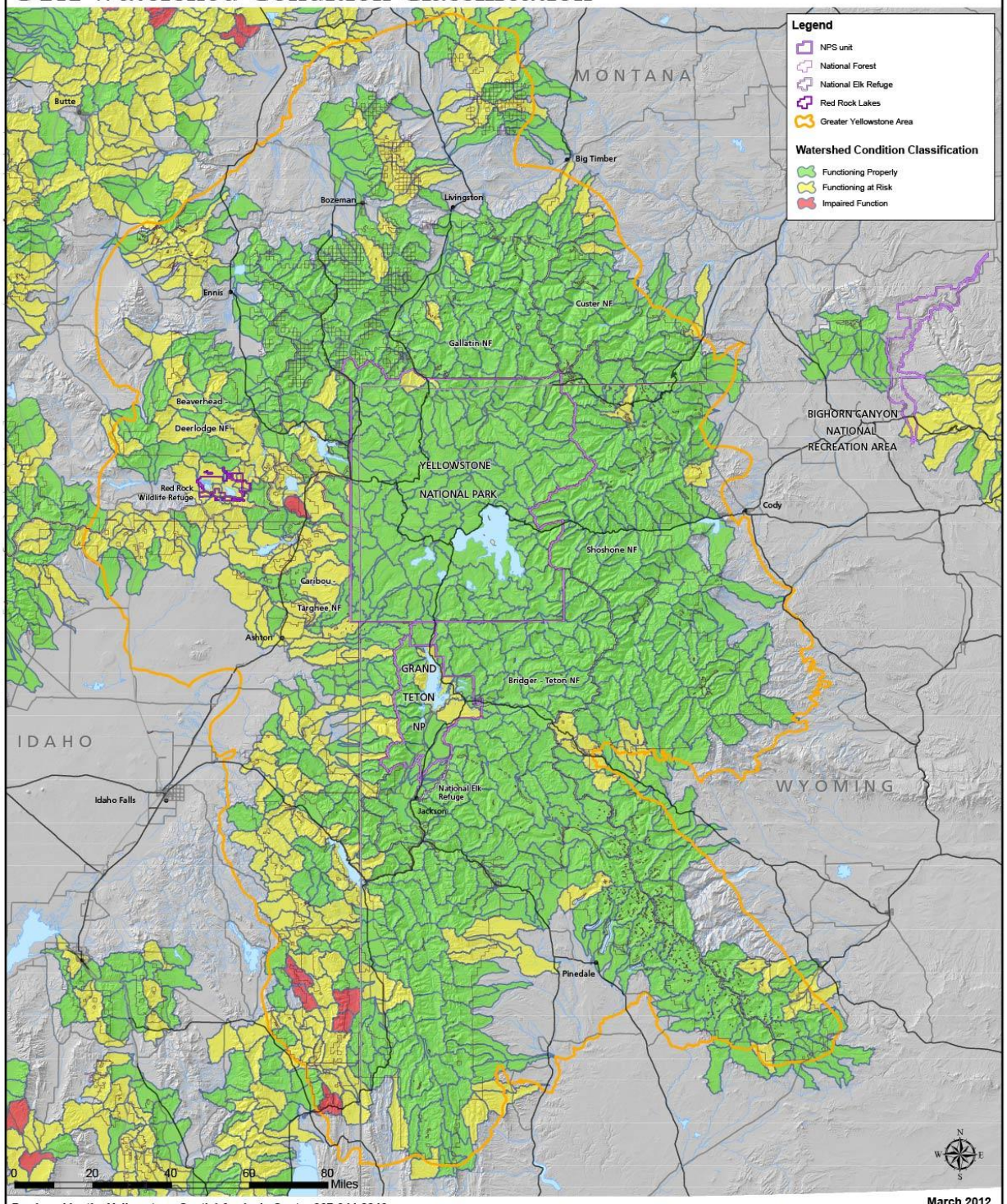
class	explanation	description	score range
Class 1	Functioning Properly	Good	1.0 to 1.6
Class 2	Functioning at Risk	Fair	1.7 to 2.2
Class 3	Impaired Function	Poor	2.3 to 3.0

The National Forest use of WCF is intended to use action plans and projects to improve watershed conditions and hence attribute scores and ratings and demonstrate improvement. All National Forest WCF ratings were completed in 2011 with results and and watershed condition class maps available at http://www.fs.fed.us/publications/watershed/

National Forest land WCF ratings are rated in the map below with green = Class 1 good, yellow = Class 2 fair, and red = Class 3 poor.

The ratings for the 94 HUC6 watersheds in Yellowstone National Park were completed on February 29 and March 1, 2012, by YNP staff. The YNP ratings were the first attempt to use the WCF on non-National Forest Lands. The WCF was then completed for the other GYA federal lands including Grand Teton NP, National Elk Refuge, Rockefeller Memorial Parkway, and Red Rock Lakes National Wildlife Refuge. A map of the entire GYA WCF ratings is shown below.

GYA Watershed Condition Classification



Produced by the Yellowstone Spatial Analysis Center 307-344-2246

March 2012

Any attribute based watershed condition assessment process is limited by the use of "one size fits all" generalized attribute criteria and is only at best a crude approximation of much more complex natural and/or changed conditions. The primarily utility of watershed condition assessment products is an overall perspective of watershed conditions which can be expanded even further when large land areas, such as the GYA are rated and mapped.

Since the WCF was developed as a National Forest process, the applicability to NPS and USFWS lands was not previously tested. Potential issues with applying the process to NPS and USFWS includes:

1) The rating attributes were developed for US Forest Service multiple use lands with much of the score variation due to road density, timber sales, livestock grazing, wildfires, and weeds. Since National Park Service mandates are different, featuring ecosystem protection and visitor use emphasis, not all of the atttibues are as applicable.

2) National Park Service mandates and agency philosophy is more likely to consider wildfires, and subsequent erosion and landscape alteration, as a natural process.

3) Yellowstone and Grand Teton National Parks do not have a program of horse/cattle livestock allotments grazing so the variability in rangland vegetation is largely due to wildlife.

For most attributes, such as water quality, water quantity flow characteristics, aquatic habitat condition, aquatic biological parameters, weeds, insects disease, and air quality the ratings of attibutes is not particularly subject to NF, NPS, or USFWS mandates or philosophy.

The rating results for the GYA HUC's enables a "snapshot" of watershed condition in the various GYA units. Several observations are offered:

Yellowstone National Park (map below) has excellent overall watershed condition with 93 of the 94 overall watershed rated as good or "functioning properly".

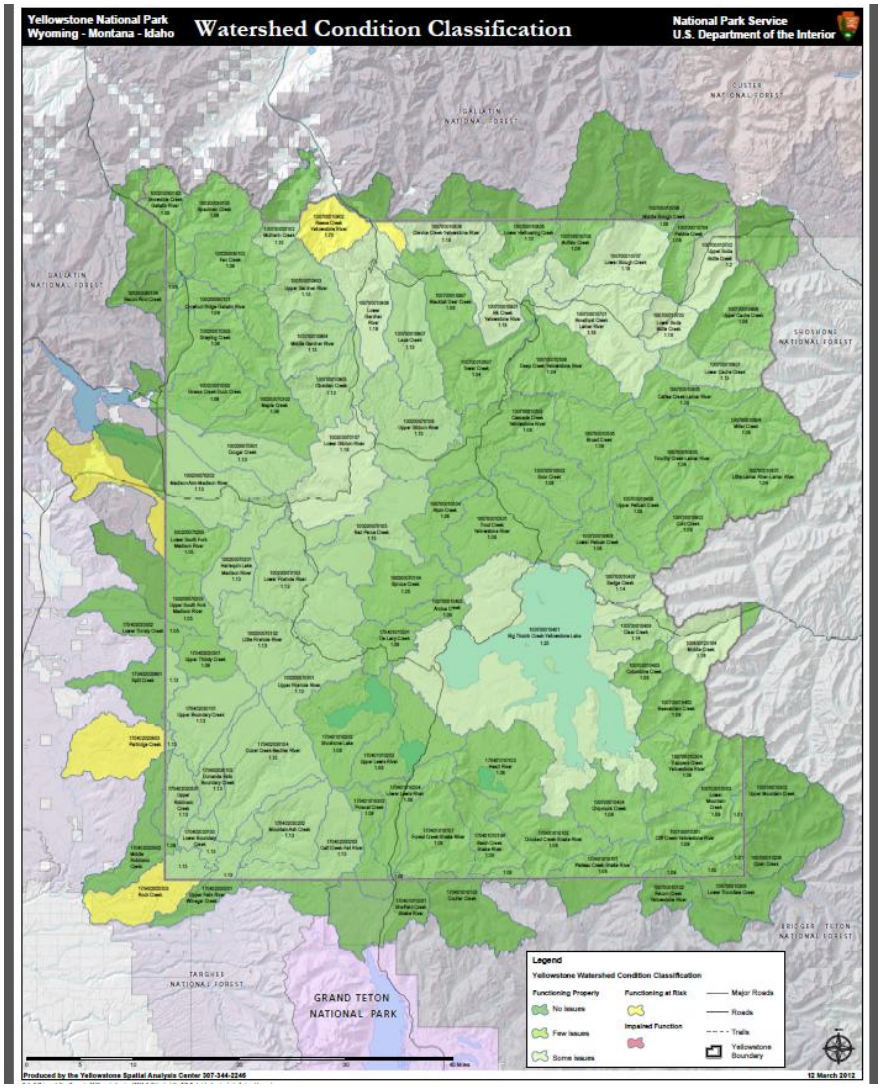
Only 1 HUC6, Reese Creek, was rated as "functioning at risk" due to diversions, and historical agricultural soil and vegetative disturbance prior to the HUC6's s inclusion into YNP. Reese Creek, with the historical disturbances, is a unique HUC for the otherwise relatively pristine YNP.

Fire condition class 2 (functioning at risk) was generally assigned to HUC's dominated by Douglas Fir where FRCC is a major portion of the HUC in the Northern ungulate winter range. These HUC6 watersheds include the majority of YNP exotic weed problems.

Attribute ratings for the aquatic biological parameters were much more frequently rated as fair or functioning at risk due to the extensive YNP occurrence of non native fish species such as brook, rainbow, lake, and brown trout, New Zealand mud snails and other aquatic invasive species.

Many of the YNP HUC6 watersheds had a "poor" ratings for road proximity to water due to the pre-ponderance of YNP highways which parallel rivers such as the Madison, Gibbon, Yellowstone, and

Lamar. Since most of the main YNP road system consists of paved highways with mature fill slope and SMZ vegetation, the actual water quality impact of the highway system is quite limited.



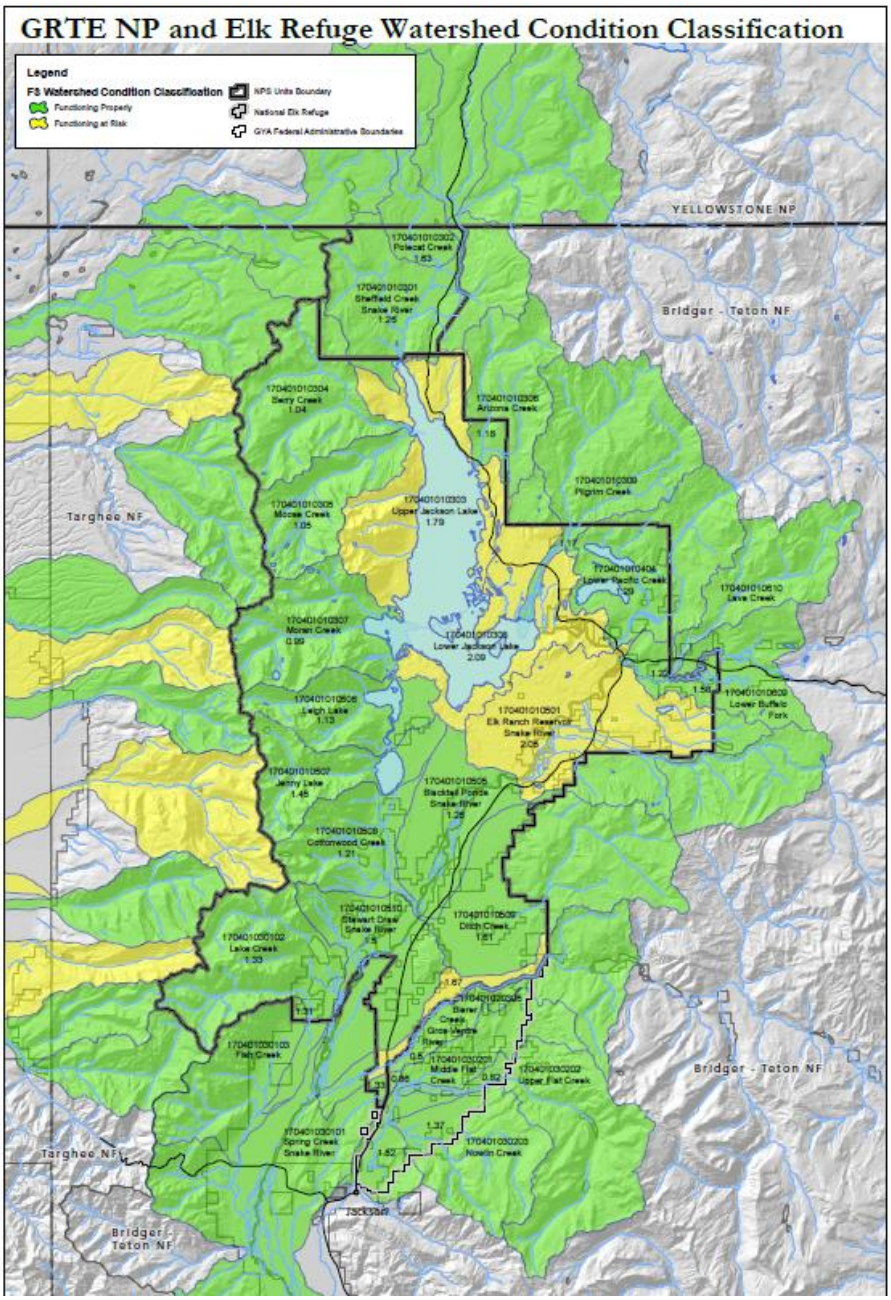
Water quality in YNP is generally excellent with only a few localized areas of degradation, notably Soda Butte Creek, which has elevated iron and below reference populations of aquatic life probably due to the historical mining activity in the Soda Butte Creek drainage. Geothermally heated and chemically enriched waters and are considered "natural" via the WCF guidance and not considered water quality degradation.

Soils and vegetation attributes in YNP had a pre-ponderance of high ratings.

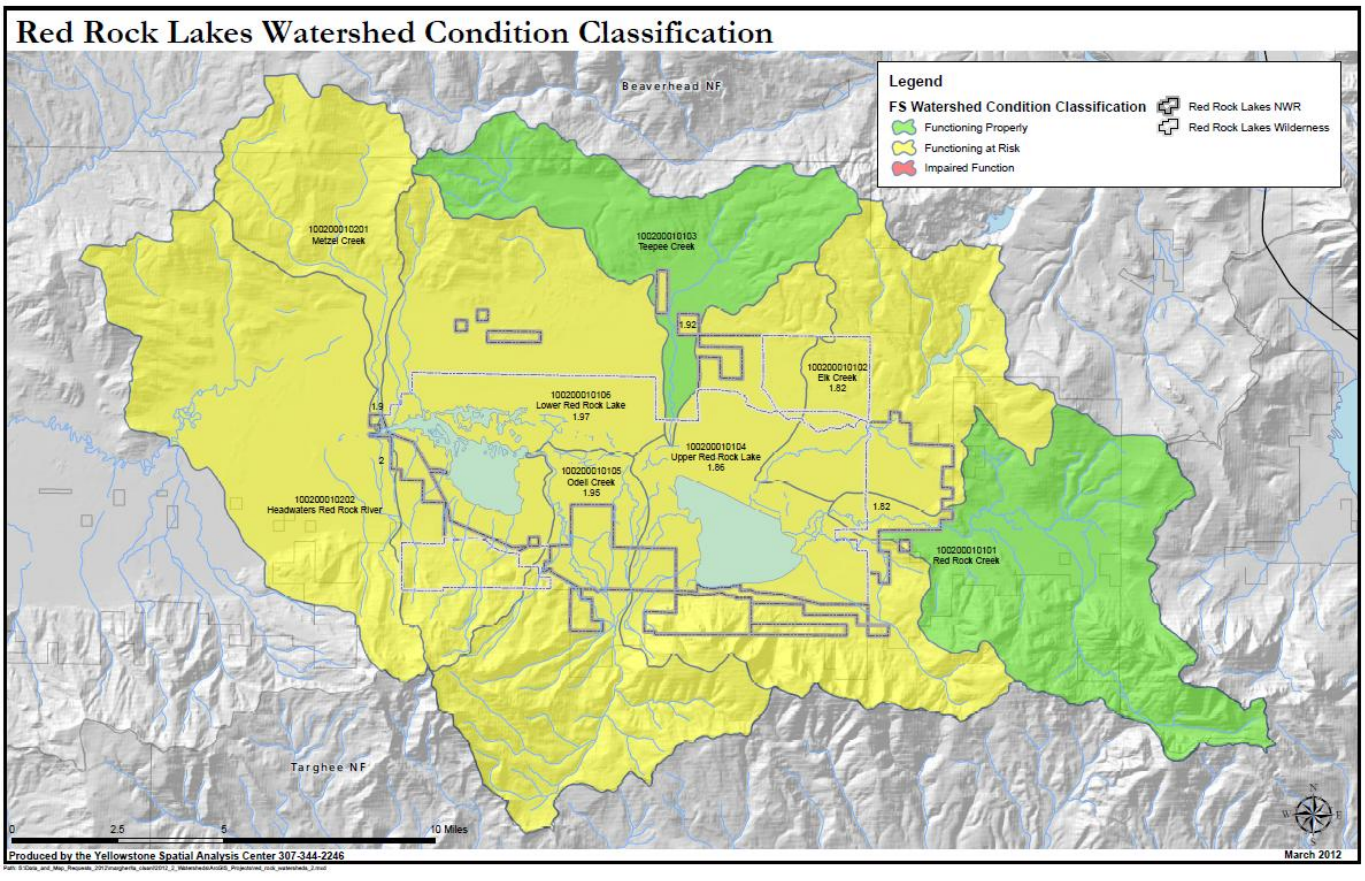
Since Yellowstone National Par has such "good" watershed condition, the overall map shows the Park is all green except for Reese Creek. Additional individual attributes maps may be useful to better distingish YNP watershed conditions such as aquatic invasives, fire condition class, or weeds.

Grand Teton NP (map below) has several functioning at risk watersheds due to historical and active irrigation diversions, Jackson Lake and Snake River discharge modifications from Jackson Lake dam, illegal horse trails, flow alteration from nearby wells, weeds in concentrated areas of human/horse/agricultural, grazing, and very concentrated trail use and riparian degradation in the Jenny Lake area.

The **National Elk Refuge** watersheds are all mapped as functioning properly although some watershed degradation and impacts occur from Gros Ventre River and Twin Creek diversions and dewatering. The Refuge has some impacts from streambank trampling, loss of woody riparian vegetation, and nutrients from concentrated elk use contribute to reduced water quality.



The **Red Rock Lakes National Wildlife Refuge** (map below) is entirely rated as functioning at risk with many watershed condition impacts from adjacant lands and activities.



Red Rock Creek is in good condition but non-native fishes have all but eliminated native Westslope and Grayling. Upstream of the Refuge cattle grazing impacts and road sediment has resulted in a 303(d) listing. Elk Creek and Limestone Creek are in good condition but has been historically disconnected to Red Rocks lakes resulting is elimation of grayling .

Upper Red Rock Lake is also in good condition but road sediment sources and cattle issues above the watershed on private land have contributed to the 303d listing for sediment and the filling in of the lake. The sediment has significant affects to fish populations and native species. Non-native fish are also a problem and have heavily impacted the native Westslope cutthroat and grayling. Most of the small streams that would flow into the lake have been diverted into flood irrigation and cut off potential habitat. Conifer encroachment directly related to fire suppression has also changed the vegetation community and water yield.

Odell Creek is one of the few watersheds that still has a population of Westslope cutthroat and is in relatively good condition. The Creek is diverted into flood irrigation which isolates the cutthroat population. Conifer encroachment and grazing pressure from the Sheep Experiment Station in the upper watershed are issues.

Lower Red Rock Lake is generally is good condition in the Refuge but there are some severe grazing problems adjacent to the Refuge. The lake is too warm and shallow to support native grayling and trout populations year round and it is unclear if that is a natural state or influenced from human activities. Most of the streams that would typically flow into the lake have all been diverted into flood irrigation. The lake and tributaries are on the 303(d) list for sediment which has filled in the lake severely impacting grayling habitat.

GYA National Forests WCF results are described in detail in individual Forest reports but some generalities from the GYA WCF map are evident including:

The GYA parts of the Gallatin and Custer NF are predominantly rated as functioning properly with the most common attributes for downgrading due to aquatic habitat fragmentation, exotic fish species, areas of historical logging activity (primarily Bridger, Gallatin and Crazy ranges), and wildfire particularly the 2006 Derby fire.

The Shoshone NF is also predominantly rated as functioning properly with some at risk watersheds due mainly to exotic fish species and localized insufficient road maintenance, and road proximity to streams.

The Beaverhead NF has numerous functioning at risk watersheds and 1 impaired watershed in the Centennial and Gravelly ranges due to 303(d) listed streams, exotic aquatic species, riparian grazing issues, and weeds.

The Bridger Teton NF in the GYA is dominated in area by the Teton and Bridger Wilderness areas which are all functioning properly. The largest concentration of functioning at risk watershed in the GYA on the BTNF are west and southwest of Pinedale in the Salt River range which have several functioning at risk watershed due primarily to water quality problems, road erosion, and weeds.

The Caribou – Targhee has by far the largest number of functioning at risk watersheds and 6 impaired function watersheds due to 303(d) listed streams, numerous water quality problems, exotic fish species, historical timber harvesting, high road density, grazing issues, and weeds.

Future use of the GYA WCF map and assessments

The 2012 WCF ratings and maps were developed in response to GYCC funding of the 2011 "Watershed Management in the Greater Yellowstone Area: An Interagency Strategy" plan which included extending the WCF framework to the entire GYA. The 2013 and 2014 strategic plan calls for identifying priority watersheds for improvement and watershed action plans. The National Forest WCF priority watershed identification and action plans are being driven by agency direction with at least 1 priority watershed and action plan developed and included in the USFS WCATT database (WCF database and maps) for each Forest. National Forests are further being directed to record all priority watershed accomplishments in the WIT (Watershed Improvements Tracking) database bay 10/12/2012. The NPS and USFWS do not have an equivalent of the WCATT database, do not have specific agency direction

to identify priority watersheds or develop priority watershed action plans, and do not have a WIT database.

Recommendations and potential future GYA WCF activities include:

- Incorporate the YNP, GTNP, Elk Refuge, and RRNWR CF ratings into the USFS WCATT database.

- Consider developing attribute specific maps for selected WCF attributes to better clarify WCF rating patterns in the GYA. For example a GYA map of water quality problems, or exotic invasive aquatic species, or riparian vegetative condition could be useful.

- GYA NF's continue to comply with USFS direction to list priority watersheds, develop and maintain priority watershed action plans, and update the WCATT database.

- YNP, GTNP, Elk Refuge, and RRNWR include the WCF ratings and identified impairment along with other known watershed information (such as wildlife, recreation, facility etc. information not included in the WCF) to identify priority watersheds and at least a list of watershed improvements. Hopefully the GYA WCF products will be useful for obtaining NPS and NFWS funding to address areas in need of improvement.

- Apply the WCF process to BLM areas within the GYA in order to complete WCF attribute ratings for 100% of the federal lands in the GYA. Most of these un-rated BLM lands are in the Pinedale, Wyoming, around the Red Rock Lakes NWR, and adjacent to the Caribou Targhee NF.