



# Conservation Success Index: Yellowstone Cutthroat Trout

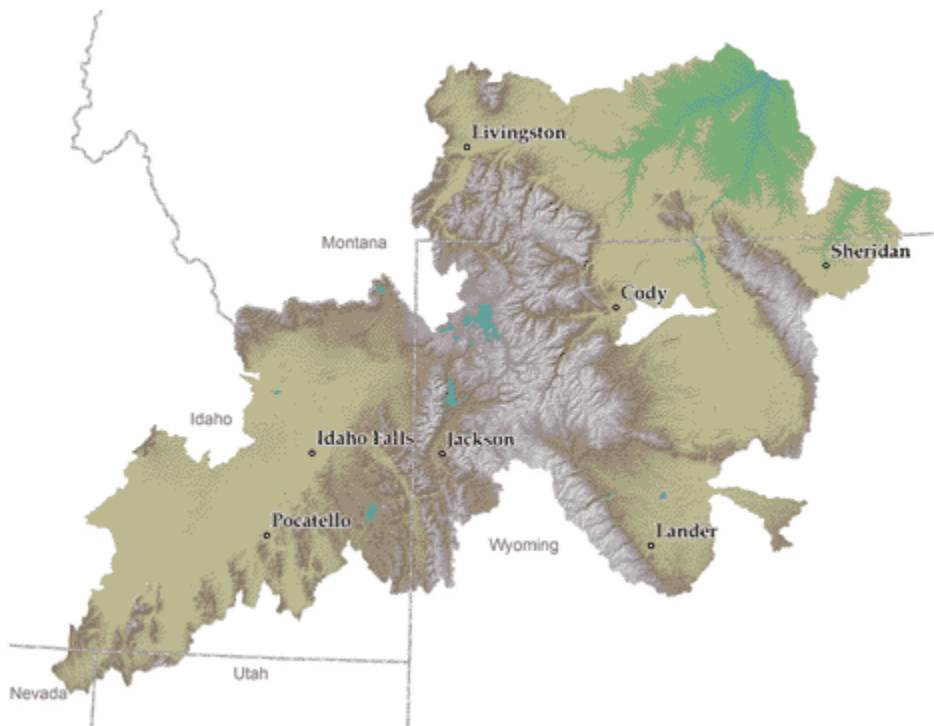
*ONCORHYNCHUS CLARKII BOUVIERI*

Rev. 2.0 - 9/2009

## SPECIES SUMMARY

Yellowstone cutthroat trout (YCT) are spring/early summer spawners with three main life history patterns found among and even within populations. Resident fish remain in a relatively small stream area their entire life, while fluvial and adfluvial fish migrate from mainstem rivers and lakes, respectively, to tributaries to spawn.

## Historic Range Relief Map



Historically, these fish occupied much of the Yellowstone River basin spreading across southern Idaho, Montana, northwestern Wyoming, and small regions of Nevada and Utah. Today, however, genetically pure YCT are found in less than half of their historic range and are mostly restricted to waters within the boundaries of Yellowstone and Grand Teton National Parks and surrounding Forest Service lands. Despite an earlier petition, the species is not Federally listed under the ESA, but is widely characterized as a “sensitive species” or “species of special concern” by agencies.

The 88,000-acre Yellowstone Lake still houses the largest population of cutthroat – of any kind – to be found anywhere in the world. This stronghold, however, is now in jeopardy, as the highly piscivorous lake trout was introduced illegally and repeatedly into the lake in the 1980s and '90s. Aside from the Yellowstone Lake population, other YCT populations have also been impacted by various introduced salmonids including rainbow trout, which pose a hybridization threat, as well as brown and brook trout. Whirling disease and the New Zealand mud snail are also now present in drainages within the Yellowstone National Park and may present future threats to the species.

For the CSI, YCT were scored for various factors falling under the 4 basic categories of Range-wide Condition, Population Integrity, Habitat Integrity, and Future Security, and these scores were used to prioritize management actions.

#### Key CSI Findings

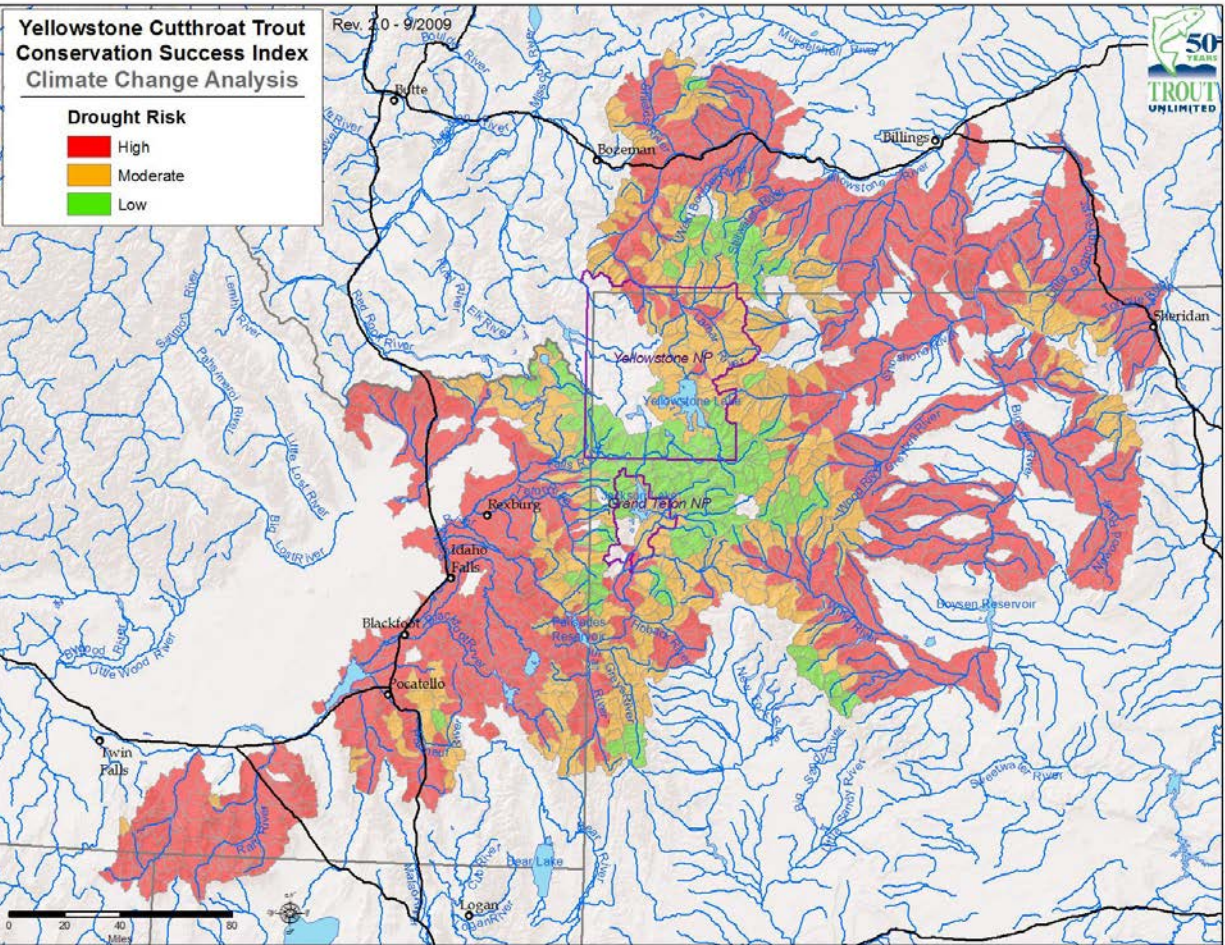
- 49% of watersheds within historic range are currently occupied (= 511 of 1042)
- 58% of extant populations had a total CSI score > 80 (out of 100)
- Median Range-wide Condition score (extant populations only) = 22/25 (range 10-25)
- Median Population Integrity score (extant populations only) = 18/25 (range 6-24)
- Median Habitat Integrity score = 19/25 (range 5-25)
- Median Future Security score = 21/25 (range 13-24)
- % of watersheds prioritized for specific management actions:
  - 31% protection
  - 50% reintroduction
  - 19% restoration

Many watersheds have lost YCT populations so only Habitat Integrity and Future Security could be scored, leading to a low total CSI score for these watersheds. Several specific threats to YCT were identified through the CSI. Habitat Integrity scores were negatively affected by poor land stewardship and water quality, while many Population Integrity scores were lowered by introgression with exotic species (threatening genetic integrity) and vulnerability to disease. Under the Future Security category, climate change and introduced species posed the biggest threats to the future welfare of the species. Due to the loss of local populations in many watersheds still retaining relatively high-quality habitat, reintroductions are a priority for management activities. Reintroductions must, however, be planned

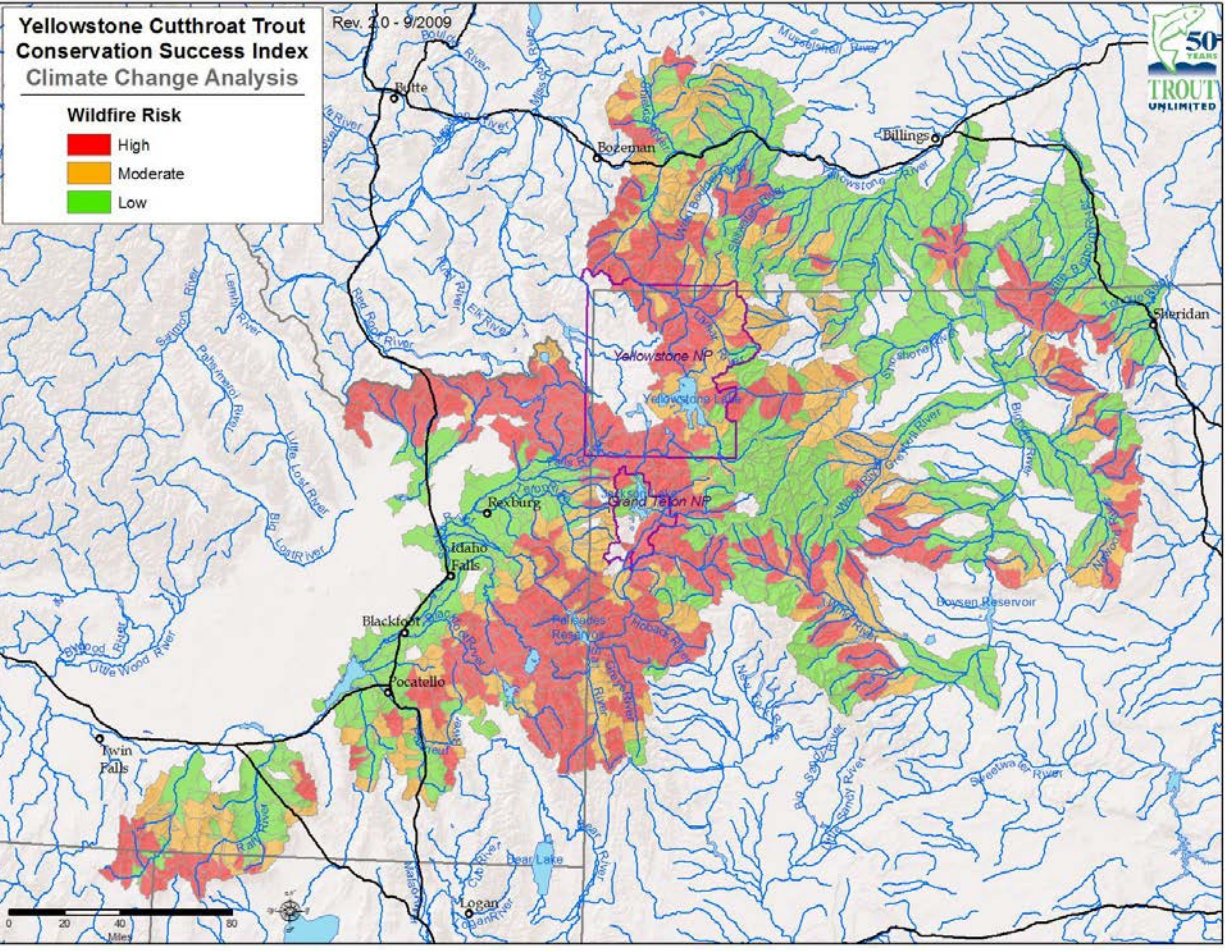


in conjunction with management of exotic species, the primary threat to YCT.

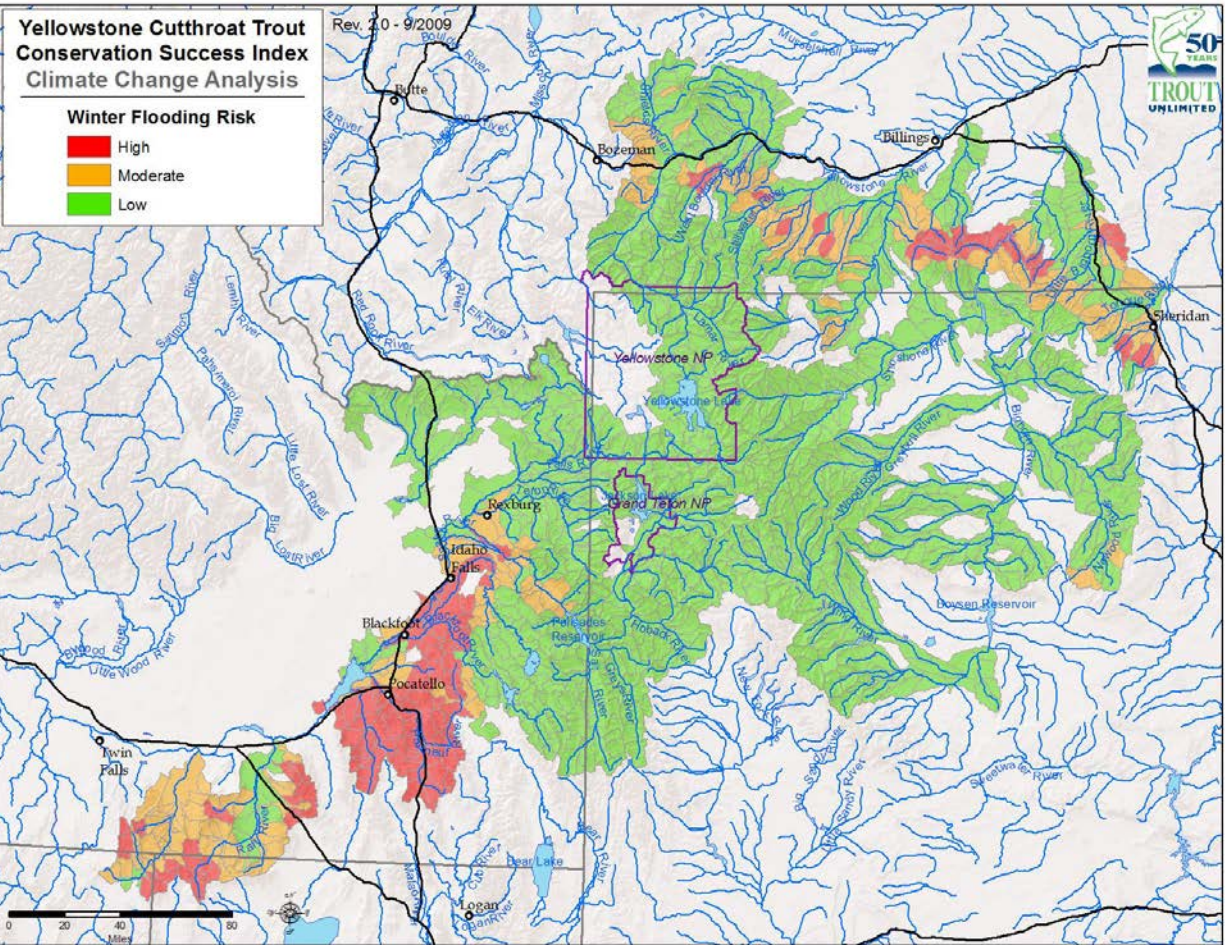
Written by Helen Neville, TU, 11/16/06



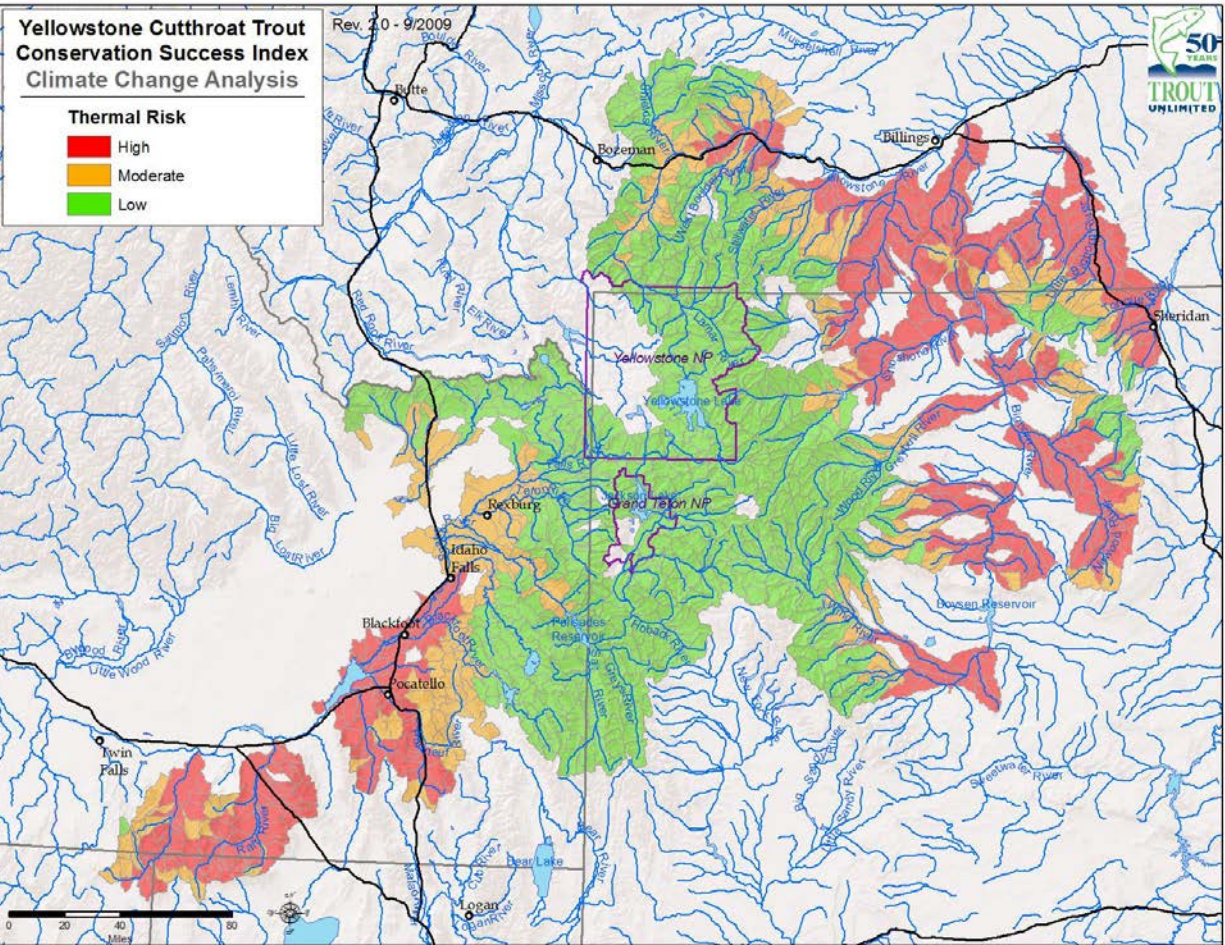




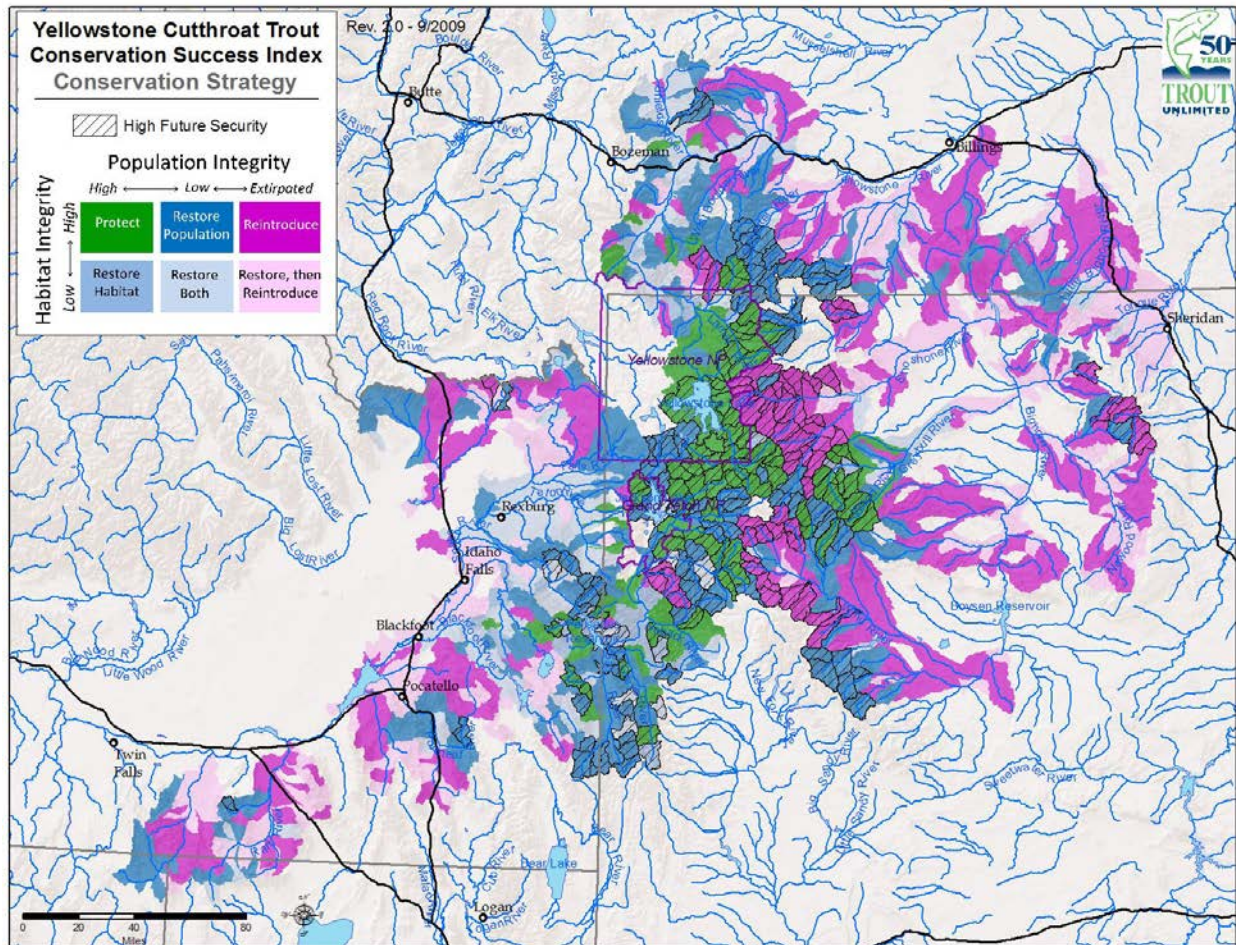




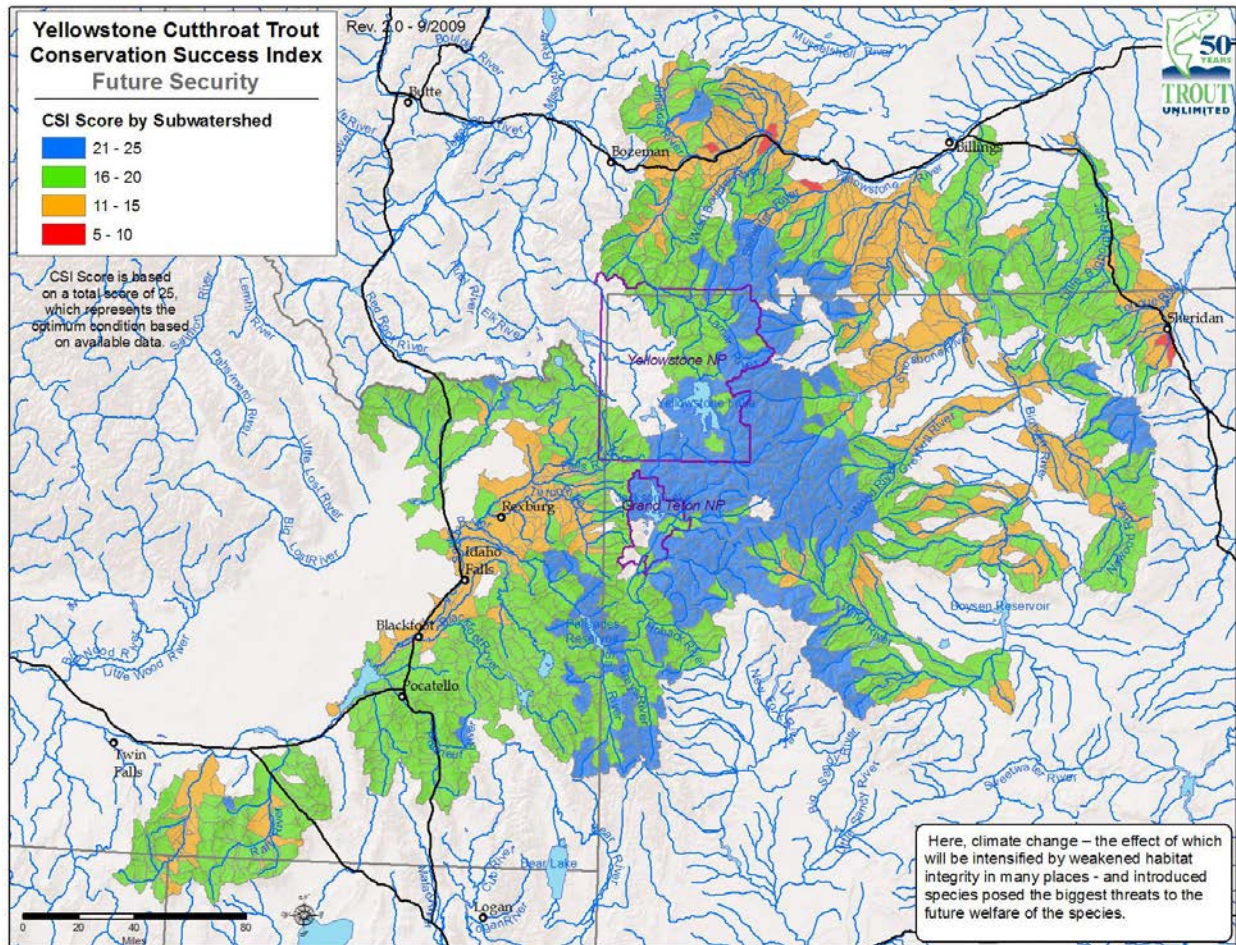








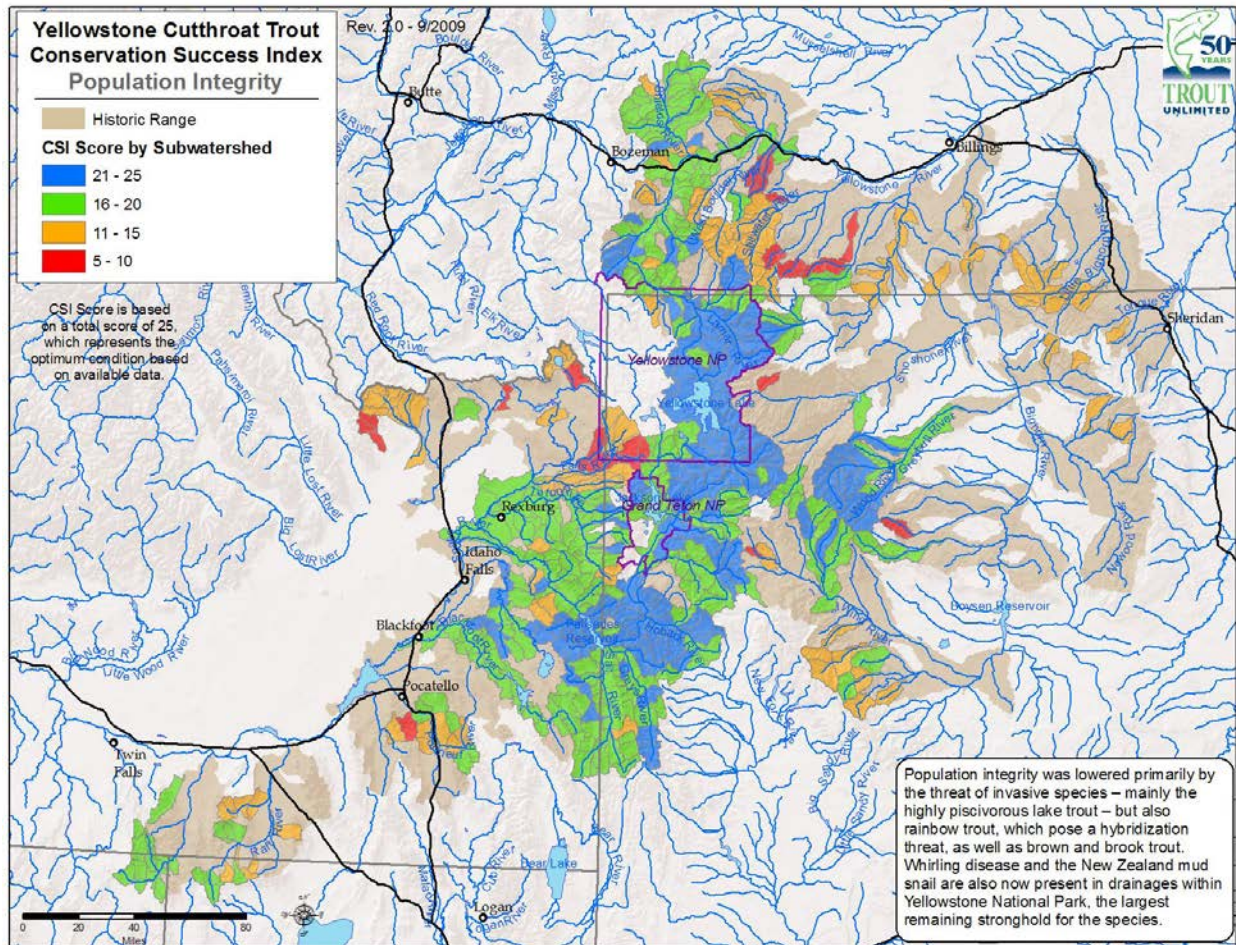




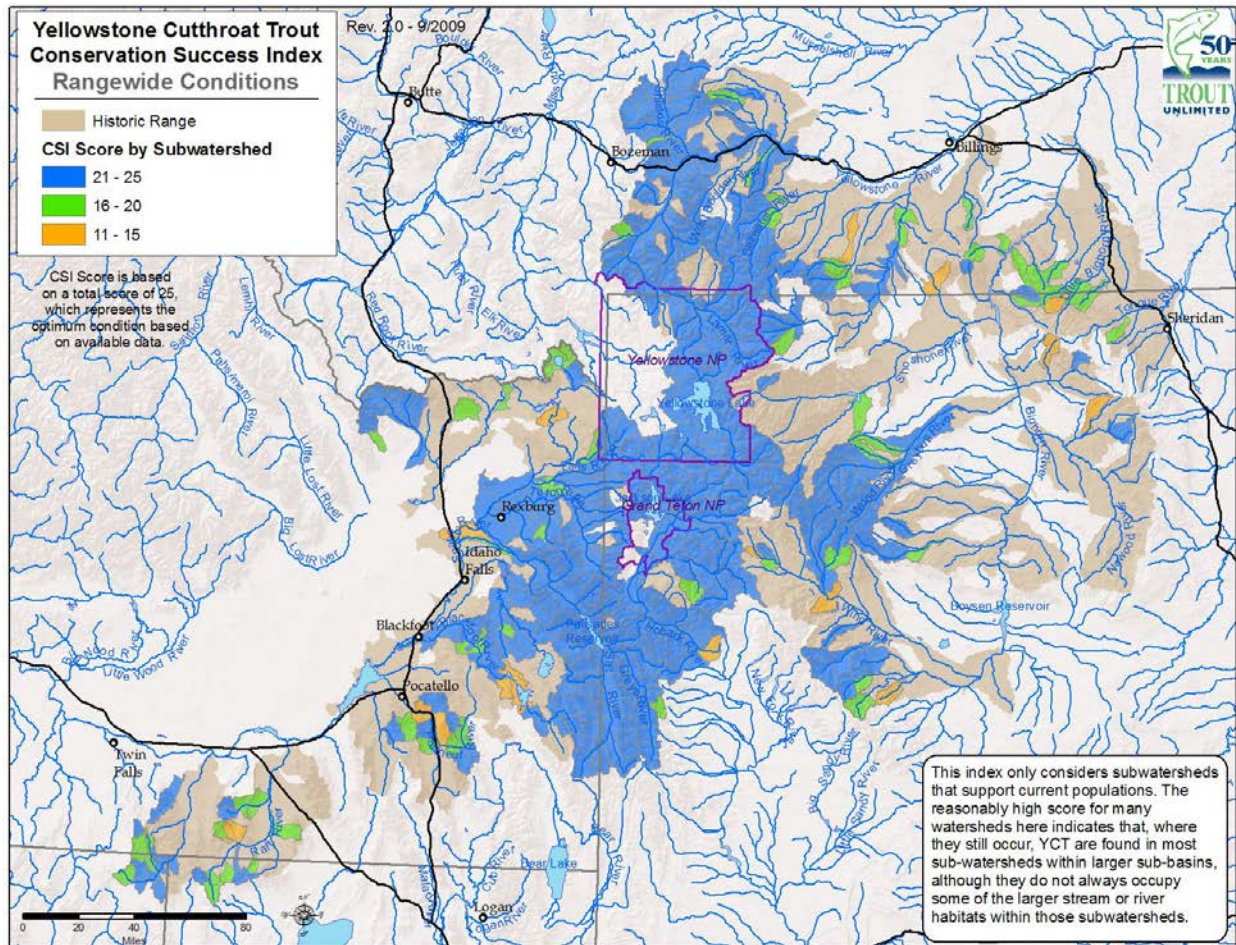




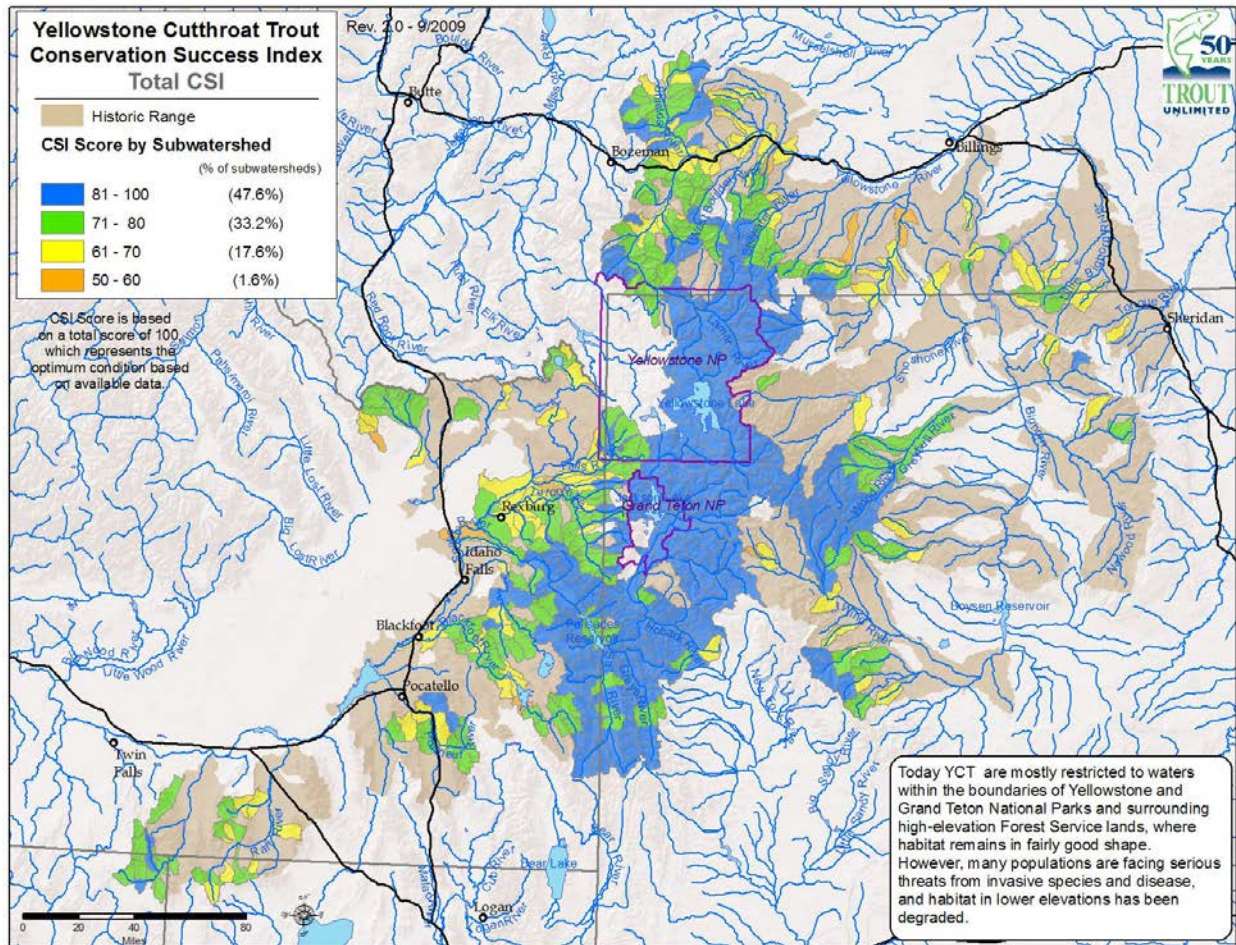












**Conservation Success Index**  
Yellowstone and Snake River Fine Spotted Cutthroat Trout Rule Set

April 2008

**Range-wide Conditions**

Scored for conservation populations as defined by assessment using different historic ranges for the two species.

Historic habitat is all perennial streams and connected, natural lakes across historic range. Lakes less than 2 hectares that are connected to streams are considered stream habitat while lakes greater than 2 hectares or isolated lakes are calculated as lake habitat.

1. Percent historic stream habitat occupied. Portions of the stream network that coincide with natural lakes in the assessment data should be excluded as stream habitat.

| <b>Occupied stream habitat</b> | <b>CSI Score</b> |
|--------------------------------|------------------|
| 0 – 9%                         | 1                |
| 10 – 19%                       | 2                |
| 20 – 34%                       | 3                |
| 35 – 49%                       | 4                |
| 50 – 100%                      | 5                |

May, B.E., W. Urie, B.B. Shephard and the Yellowstone Cutthroat Interagency Coordination Group. 2003. Range-wide status of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*): 2001. Yellowstone Cutthroat Interagency Coordination Group, Boise, Idaho.

2. Percent subbasins occupied.

| <b>Percent subbasins occupied</b> | <b>CSI Score</b> |
|-----------------------------------|------------------|
| 1-49%                             | 1                |
| 50-69%                            | 2                |
| 70-79%                            | 3                |
| 80-89%                            | 4                |
| 90-100%                           | 5                |

Source: May et al. 2003.

U.S. Geologic Survey, Subbasins (4<sup>th</sup> order HUCs), 1:2,000,000, July 2005.

3. Subwatersheds occupied within subbasin.



| <b>Percent subwatersheds occupied by subbasin</b> | <b>CSI Score</b> |
|---|------------------|
| 1 – 20%   | 1                |
| 21-40%  | 2                |
| 41-60%  | 3                |
| 61-80%  | 4                |
| 81-100%   | 5                |

Source: May et al. 2003.

U.S. Department of Agriculture, Idaho, Wyoming Geographic Information Science Center, Idaho Department of Water Resources, Montana Natural Resources Information System. Sub-watersheds, 6<sup>th</sup> order HUCs

4. Habitat by stream order occupied.

| <b>Occupied 2<sup>nd</sup> order streams and higher</b> | <b>CSI Score</b> |
|---|------------------|
| 0 – 9%  | 1                |
| 10 – 14%  | 2                |
| 15 – 19%  | 3                |
| 20 – 24%  | 4                |
| 25 – 100%   | 5                |

Source: May et al. 2003.

US Geological Survey, National Hydrography Dataset Plus, 1:100,000.

5. Historic lake habitat occupied.

All natural lakes within historic range are counted as historic lake habitat. Current lake habitat is based on intersection of stream network for conservation populations with lakes.

| <b>Occupied lake habitat</b> | <b>CSI Score</b> |
|------------------------------|------------------|
| 0 – 9%                       | 1                |
| 10 – 19%                     | 2                |
| 20 – 34%                     | 3                |
| 35 – 49%                     | 4                |
| 50 – 100%                    | 5                |

Source: May et al. 2003.

US Geological Survey, National Hydrography Dataset Plus, 1:100,000.

### Population Integrity

Scored for conservation populations based on rangewide assessment.  
Lake populations were incorporated as a linear distance.

1. Density – uses tables on Population Size and Fish Presence/Abundance.

| Presence/Abundance | Population Size | CSI Score |
|--------------------|-----------------|-----------|
| R (rare)           | any             | 1         |
| C (common)         | 4 (< 50)        | 2         |
| C (common)         | 3 (50 – 500)    | 3         |
| C (common)         | 2 (500 – 2,000) | 4         |
| C (common)         | 1 (GT 2,000)    | 5         |
| A (abundant)       | any             | 5         |

Source: May et al. 2003.

2. Population Extent – based on risk table Temporal Variability.

| Rank                   | CSI Score |
|------------------------|-----------|
| 4 (LT 10 km connected) | 1         |
| 3 (10-25 km connected) | 2         |
|                        | 3         |
| 2 (25-75 km connected) | 4         |
| 1 (GE 75 km connected) | 5         |

Source: May et al. 2003.

3. Genetic Purity – based on table Fish Presence Genetics.



| <b>Genetics Rank</b>      | <b>CSI Score</b> |
|---------------------------|------------------|
| C (hybridized GT 25%)     | 1                |
| B (hybridized LT 25%)     | 2                |
| J (suspected hybridized)  | 2                |
| N (hybridized and pure)   | 3                |
| H (potentially unaltered) | 4                |
| A (pure)                  | 5                |

Source: May et al. 2003.

4. Disease Vulnerability – based on tables Fish Presence (competing species), Isolation Risk and Fish Presence Restoration Efforts .

| <b>Competing Species</b> | <b>Isolation</b> | <b>CSI Score</b> |
|--------------------------|------------------|------------------|
| Yes                      | 1/2              | 1                |
| Yes                      | 3/4              | 2                |
| No                       | 1                | 3                |
| No                       | 2                | 4                |
| No                       | 3/4              | 5                |

Source: May et al. 2003.

5. Life History Diversity – three potential: resident, fluvial, and ad-fluvial. Use risk table for Isolation Risk to determine if migratory (fluvial) is present. Otherwise assume resident and check for lake (ad-fluvial).

| <b>Isolation Risk</b>                         | <b>Lake</b>   | <b>CSI Score</b> |
|---|---|------------------|
| 4 (isolated)                                  | Historic yes, present no                                | 1                |
| 3 (questionable)                              | Historic yes, present no                                | 2                |
| 3 (questionable)                              | Historic yes, present yes<br>or historic no, present no | 3                |
| 1 or 2  | Historic yes, present no                                | 3                |
| 2 ( migratory present but weak<br>connection) | Historic yes, present yes<br>or historic no, present no | 4                |
| 1 (migratory forms present)                   | Historic yes, present yes<br>or historic no, present no | 5                |

Source: May et al. 2003.

US Geological Survey, National Hydrography Dataset Plus, 1:100,000.

## Habitat Integrity

Scored for all subwatersheds in historic range.

1. Land Stewardship – score using AND between two indicators

| Protected occupied habitat | Subwatershed protection | CSI Score |
|----------------------------|-------------------------|-----------|
| none                       | any                     | 1         |
| 1 – 9%                     | LT 25%                  | 1         |
| 1 – 9%                     | GE 25%                  | 2         |
| 10 – 19%                   | LT 25%                  | 2         |
| 10 – 19%                   | GE 25%                  | 3         |
| 20 – 29%                   | LT 50%                  | 4         |
| 20 – 29%                   | GE 50%                  | 5         |
| GE 30%                     | any                     | 5         |

Source: National Atlas, Federal Land Status.

Tele Atlas/GDT, Protected areas, 1:100,000. 2004.

U.S. Department of Agriculture, Forest Service, Geospatial Service and Technology Center.  
Inventoried Roadless Areas.

2. Watershed Connectivity (use barriers data provided with assessment and dam data.)

| Current/historic connectivity 6th | CSI Score |
|-----------------------------------|-----------|
| LT 50%                            | 1         |
| 50 – 74%                          | 2         |
| 75 – 89%                          | 3         |
| 90 – 94%                          | 4         |
| 95 – 100%                         | 5         |

Current/historic connectivity 5<sup>th</sup>:

- GT 90%: +1
- LT 50%: -1

Source: May et al. 2003.



US Army Corps of Engineers, Dams, March 22, 2006.

US Geological Survey, National Hydrography Dataset Plus, 1:100,000.

### 3. Watershed Conditions

| Land conversion | CSI Score |
|-----------------|-----------|
| GE 30%          | 1         |
| 20 – 29%        | 2         |
| 10 – 19%        | 3         |
| 5 – 9%          | 4         |
| 0 - 4%          | 5         |

CSI score is downgraded 1 point if road density is GE 1.7 and LT 4.7 mi/square mile.  
If road density is GE 4.7 mi/square mile it is downgraded 2 points.

Source: Tele Atlas North America, Inc./Geographic Data Technology, Inc., ESRI. Roads. 2005.

U.S. Geologic Survey, Idaho, Oregon, Washington, Wyoming GAP Analysis Project (100 meter). Land cover/Land use.

### 4. Water Quality

| Miles 303(d)<br>Streams | Percent<br>Agricultural Land | Number<br>Active Mines | Strm mi/rd<br>mi* | CSI<br>Score |
|-------------------------|------------------------------|------------------------|-------------------|--------------|
| GT 0                    | 58-100%                      | GE 10                  | 0.5 – 1.0         | 1            |
|                         | 28-57%                       | 7-9                    | 0.25 – 0.49       | 2            |
|                         | 16-27%                       | 4-6                    | 0.24 - 0.10       | 3            |
|                         | 6-15%                        | 1-3                    | 0.05 – 0.09       | 4            |
|                         | 0-5%                         | 0                      | 0 – 0.04          | 5            |

Score for worst case.

Source: Tele Atlas North America, Inc./Geographic Data Technology, Inc., ESRI. Roads. 2005.

U.S. Environmental Protection Agency. 303(d) streams, 1:24,000; 2002.

US Geological Survey, National Hydrography Dataset Plus, 1:100,000.

U.S. Geologic Survey, Idaho, Oregon, Washington, Wyoming GAP Analysis Project (100 meter). Land cover/Land use.

U.S. Geological Survey, Mineral Resources Data System: U.S. Geological Survey, Reston, Virginia. Active Mines. 2005.

## 5. Flow Regime

| Number of dams | Number of diversions | Storage (acre-ft)/stream mile | CSI Score |
|----------------|----------------------|-------------------------------|-----------|
| GE 5           | GE 30                | GE 2,500                      | 1         |
| 3 – 4          | 20 – 29              | 1,000 – 2,499                 | 2         |
| 2              | 10 – 19              | 250 – 999                     | 3         |
| 1              | 5 – 9                | 1- 249                        | 4         |
| 0              | LT 5                 | 0                             | 5         |

Score for worst case.

Source: U.S. Army Corps of Engineers. Dams, March 22, 2006

US Geological Survey, National Hydrography Dataset Plus, 1:100,000.

## Future Security

Scored for all subwatersheds in historic range.

### 1. Land Conversion – modeled based on slope, land ownership, roads, and urban areas.

| Land Vulnerable to Conversion | CSI Score |
|-------------------------------|-----------|
| 81 – 100%                     | 1         |
| 61 – 80%                      | 2         |
| 41 - 60%                      | 3         |
| 21 - 40%                      | 4         |
| 0 – 20%                       | 5         |

Sources: National Atlas, Land ownership.

Tele Atlas/GDT, Population centers, 1:300,000; 1997.

Tele Atlas/GDT, Road network, 1:100,000; 2002.

USGS Digital Elevation Model. 30 meter.

### 2. Resource extraction

| Oil and gas leases/reserves | Mine Claims | CSI Score |
|-----------------------------|-------------|-----------|
|-----------------------------|-------------|-----------|



|          | <b>% of<br/>Subwatershed</b> |   |
|----------|------------------------------|---|
| 51-100%  | 51 -100%                     | 1 |
| 26 – 50% | 26-50%                       | 2 |
| 11 – 25% | 11-25%                       | 3 |
| 1 – 10%  | 1 – 10%                      | 4 |
| 0%       | 0%                           | 5 |

Use percent of protected land within subwatershed as qualifier.

25 – 50% protected – 1 additional point

GT 50% protected – 2 additional points

Score for worst case.

Source: Hyndman, Paul C. , and Campbell, Harry W. , Digital Databases Containing Mining Claim Density Information for Arizona, California, Colorado, Idaho, Montana, Nebraska, New Mexico, Nevada, Oregon, South Dakota, Utah, Washington, and Wyoming Created From the BLM Mining Claim Recordation System: 1996: U.S. Geological Survey Open-File Report 99-325. Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, 6/30/2005, comap\_v4\_final\_public

U.S. Department of Energy, EPCA. Oil and gas reserves, 2005.

3. Flow Modification – based on INEL hydropower potential data set.

| <b>New Dams 5th</b> | <b>New Dams 6th</b> | <b>CSI Score</b> |
|---------------------|---------------------|------------------|
| GE 0                | GE 2                | 1                |
| GE 1                | 1                   | 2                |
| GE 0                | 1                   | 3                |
| GE 1                | 0                   | 4                |
| 0                   | 0                   | 5                |

Source: U.S. Department of Energy, Idaho National Laboratory, Water energy resource assessment of the United States, 1995 - 1998.

4. Climate Change – Based on TU Climate Change analysis, which focuses on 3 identified risk factors related to climate change-

- a. Increased Summer Temperature- loss of lower-elevation (higher-order) habitat
- b. Increased Winter Flooding- Rain-on-snow events lead to more and larger floods

- c. Increased Wildfire- earlier spring snowmelt coupled with warmer temperatures results in drier fuels and longer burning, more intense wildfire

| <b>TU Climate Change Analysis</b>         |                  |
|---|------------------|
| <b>Climate Risk Factors</b>               | <b>CSI Score</b> |
| (High, Mod., Any)                         | 1                |
| (Mod., Mod., Mod.)<br>OR (High, Low, Low) | 2                |
| (Mod., Mod., Low)                         | 3                |
| (Low, Low, Mod.)                          | 4                |
| (Low, Low, Low)                           | 5                |

Source: PRISM Group, Oregon State University. Mean July Temperature, 1970 – 2000. 800 meter.

PRISM Group, Oregon State University. Monthly Precipitation Normals, 1970 – 2000. 800 meter.

U.S. Forest Service, LANDFIRE Fire Behavior Fuel Model 13. 2006.

USGS Digital Elevation Model. 30 meter.

5. Introduced Species – do not currently have rangewide data on introduced species.

| <b>Present in 5th</b> | <b>Present in 6th</b> | <b>Road Density</b> | <b>CSI Score</b> |
|-----------------------|-----------------------|---------------------|------------------|
| Yes                   | Yes                   | any                 | 1                |
| Yes                   | No                    | GT 4.7              | 2                |
| Yes                   | No                    | 1.7 - 4.7           | 3                |
| Yes                   | No                    | LT 1.7              | 4                |
| No                    | No                    | any                 | 5                |

Source: May et al. 2003.

Tele Atlas North America, Inc./Geographic Data Technology, Inc., ESRI. Roads. 2005.