

# Goal 2

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## Protect and enhance natural resources

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Climate, geology, soils, plants, wildlife and other habitat elements combine to make the gorge rich in natural resources. Many significant natural areas occur in the gorge, ranging from old growth forests in the Multnomah Basin to bunchgrass prairies in the Columbia hills. The diverse climate fosters nearly 1,000 species of wildflowers, many of which are endemic to the Gorge region. The wildlife traveling in and out of the gorge, the long rivers originating many miles away with short scenic area reaches, the quality of air passing through our region – all these are resources to be protected in the scenic area. Yet the condition of all these things depends on many factors beyond our boundaries or control. For this reason, development of indicators gauging the condition of gorge natural resources is uniquely challenging and more difficult than most other topics. Indicators were created to measure the health of native plants and animals and their habitat, surface and ground water quality, and air quality.

### Objectives:

#### **2.1 PROTECT AND ENHANCE THE NATIVE PLANTS AND ANIMALS AND THE HABITATS WHICH SUPPORT THEM**

Tracking the health of gorge species and habitat function over time

#### **2.2 PROTECT AND ENHANCE QUALITY OF THE WATER AND AQUATIC HABITATS**

Measuring key characteristics of water that indicate water quality and habitat quality

#### **2.3 PROTECT AND ENHANCE QUALITY OF THE AIR**

Summarizing what's known about the air quality of the gorge

**Objective:** Protect and Enhance the Native Plants and Animals and the Habitats which Support Them

**Vital Sign Number:** 2.1.a

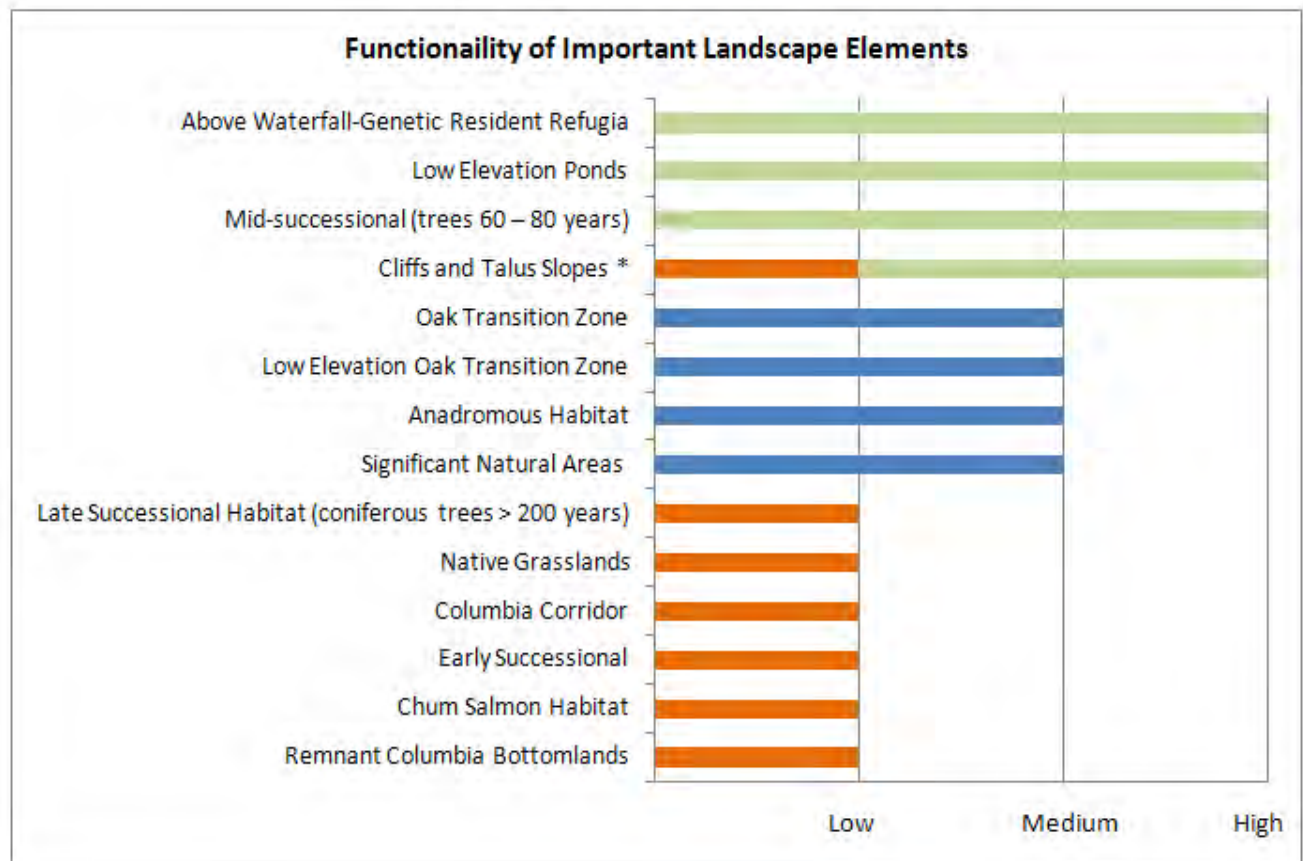
**Vital Sign Title:** Habitat Quality

**Vital Sign Measure:** Percent of priority habitat types rated as properly functioning.

**Proxy Measure:** Number of important landscape elements<sup>6</sup> in the Scenic Area that are functioning at high levels.

**What We Know:**

Three of fourteen landscape elements in the gorge are considered high-functioning: Above Waterfall-Genetic Resident Refugia (i.e. areas supporting isolated populations of genetically pure fish species); Low Elevation Ponds; and Mid-successional Forests. A fourth landscape element – Cliffs and Talus Slopes – is partially high-functioning. Additionally, four elements are medium-functioning, and six are low-functioning with Cliffs and Talus Slopes rated as partially low-functioning depending upon location.



(\* Cliffs and talus slopes are both high and low-functioning depending on location.)

<sup>6</sup> Landscape elements are components of the priority habitats based on the unique species they support and their rarity. (They are not the same as the landscape types discussed in indicator 1.2.b)

**Assessment:**

Though a majority of landscape elements in the Scenic Area are functioning at a medium or high-level, many of these elements are considered marginal and fragile. However, both Anadromous Habitat and Above Waterfall Resident-Genetic Refugia are demonstrating an improving trend. This is perhaps a reflection of a regional emphasis on salmon habitat conservation and restoration and the focus of state and federal agencies and tribal nations.

Many of the low-functioning habitats reached that status due to the conversion of land to agriculture, timber harvests and the disturbance of the natural fire cycles. Other human activities such as roads, railroads, water diversions and settlements have also contributed to reduced function.

This information is based on a largely qualitative assessment by Forest Service scientists. Future analysis will focus on spatially identifying these landscape elements and when possible monitoring specific components that affect their function. The expert opinions of the Forest Service biologists and hydrologists will continue to be an important aspect of this assessment.



Washington State Tourism

**Objective:** Protect and Enhance the Native Plants and Animals and the Habitats which Support Them

**Vital Sign Number:** 2.1.c

**Vital Sign Title:** Species Health

**Vital Sign Measure:** Percent of at-risk species<sup>7</sup> whose populations in the gorge are healthy<sup>8</sup>.

**What We Know:**

Rankings exist only for plants at this time. Twenty-nine percent (8 of 28) of the at-risk plant species, either currently existing or known to be present in the past, are known to be healthy. Eleven of the 28 at-risk plant species (39%) known to currently exist in the gorge have been observed but lack a health assessment. Twenty-five percent of the observed at-risk species in the gorge are considered less than healthy. No assessments of animal species are available.

Status of At-Risk Plant Species in the Gorge		
Species	Number	Percent
Observed – Healthy	8	29
Observed – Less than healthy	7	25
Observed – No ranking	11	39
Known to exist historically but not observed	2	7
<b>Total At-Risk Plant Species</b>	<b>28</b>	<b>100</b>

**Assessment:**

Findings are based on observations of 172 populations of at-risk species found in the gorge. The number of observations per species varies from just one for a few species to over 25 for others. Because observations of species used in the ranking can be quite old (45 population health rankings are over 20 years old) and because many observations lack a health ranking, these numbers should be considered rough estimates. Also, eleven of the species known to exist in the gorge have not been ranked for health status. If all of those observed but not ranked species were healthy, the overall ranking could be as high as 60%.

The data used in this proxy measure is the most relevant available information provided by the Oregon Natural Heritage Program (ONHP). The inventory itself is still a draft but contains very useful information for plants. For future reporting, Commission and Forest Service staffs will be working together with partner agencies to either refine this measure so that it is more easily answered with currently available data or develop new data to better answer the existing measure.

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<sup>7</sup> At-risk species are those species either listed under the federal or state Endangered Species Act or whose conservation status is ranked as endangered, threatened, imperiled, or vulnerable to extinction.

<sup>8</sup> A species population (occurrence) is one with a viability ranking of good or excellent as compiled by the ONHP.

**Objective 2.2:** Protect and Enhance the Quality of Water and Aquatic Habitats

**Vital Sign Number:** 2.2.a

**Vital Sign Title:** Surface Water Quality

**Vital Sign Measure:** Percent of streams, including the Columbia River, whose water quality is a) poor, b) fair, c) good, and d) excellent.

**Proxy Measure:** Number of watersheds, including the Columbia River, where water quality is a) impaired, and b) good.

**What We Know:**

Of the 13 watersheds in the National Scenic Area, eight have impaired water quality and five have good water quality. They break down as follows:

Western Gorge

- |                               |      |
|-------------------------------|------|
| 1. Lower Sandy River          | Good |
| 2. Western Gorge – Oregon     | Good |
| 3. Western Gorge – Washington | Good |

Central Gorge

- |                              |          |
|------------------------------|----------|
| 4. Hood River                | Impaired |
| 5. Mosier Creek              | Impaired |
| 6. Wind River                | Impaired |
| 7. Little White Salmon River | Impaired |
| 8. White Salmon River        | Good     |
| 9. Catherine & Major Creeks  | Impaired |

Eastern Gorge

- |                           |          |
|---------------------------|----------|
| 10. Klickitat River       | Good     |
| 11. Fifteen-mile Creek    | Impaired |
| 12. Lower Deschutes River | Impaired |

Entire National Scenic Area

- |                    |          |
|--------------------|----------|
| 13. Columbia River | Impaired |
|--------------------|----------|

**Assessment:**

With eight of the 13 watersheds in the gorge rated as impaired, poor water quality is a serious issue for the gorge. Because many of the rivers in these rated watersheds begin their journeys to the sea far outside the NSA boundaries, these ratings really reflect on the Northwest as a whole, not just the gorge. The types of issues are far-ranging, from harmful chemicals in the Columbia to higher than normal stream temperatures in many watersheds. Fortunately, three of the major rivers in the gorge – the White Salmon, the Lower Sandy and the Klickitat – still retain high water quality.

**Objective 2.2:** Protect and Enhance the Quality of Water and Aquatic Habitats

**Vital Sign Number:** 2.2.b

**Vital Sign Title:** Habitat Quality

**Vital Sign Measure:** Percent of native fish habitat that is properly functioning.

**Proxy Measure:** Number of watersheds, including the Columbia River, where stream habitat quality is good.

**What We Know:**

Of the 13 watersheds in the National Scenic Area, none had an overall rating of good for stream habitat quality. They breakdown as follows:

Western Gorge

- |                               |   |
|-------------------------------|---|
| 1. Lower Sandy River          | Impaired  |
| 2. Western Gorge – Oregon     | Mostly good - upper reaches; impaired - lower reaches     |
| 3. Western Gorge – Washington | Mostly moderate - upper reaches; impaired - lower reaches |

Central Gorge

- |                              |  |
|------------------------------|--|
| 4. Hood River                | Impaired                                       |
| 5. Mosier Creek              | Impaired                                       |
| 6. Wind River                | Good - upper reaches; moderate - lower reaches |
| 7. Little White Salmon River | Moderate                                       |
| 8. White Salmon River        | Moderate                                       |
| 9. Catherine & Major Creeks  | Good - upper reaches; impaired - lower reaches |

Eastern Gorge

- |                           |          |
|---------------------------|----------|
| 10. Klickitat River       | Moderate |
| 11. Fifteen-mile Creek    | Impaired |
| 12. Lower Deschutes River | Moderate |

Entire Gorge

- |                    |          |
|--------------------|----------|
| 13. Columbia River | Impaired |
|--------------------|----------|

**Assessment:**

Despite the substantial resources that have been invested in habitat enhancement and restoration, gorge watersheds still fall far short of providing good quality habitat for fish. Problems in the watersheds causing impairments are wide ranging. Common impairments are a lack of large wood either in-stream or in riparian areas, high sediment loads, and high in-stream temperatures. Many streams are also impacted in their lower reaches where highways, railroads, and hydroelectric dams significantly alter the natural flow of materials and fish. While no watershed receives a clean bill of health for habitat quality, three are considered partially good and six are rated as moderate.

**Objective 1.1:** Protect and enhance scenic quality  
**Vital Sign Number:** 1.1.g  
**Vital Sign Title:** Visibility  
**Vital Sign Measure:** To be developed

**Objective 2.3:** Protect and enhance quality of the air  
**Vital Sign Number:** 2.3.a  
**Vital Sign Title:** Air Quality  
**Vital Sign Measure:** To be developed

### **Air Quality Summary:**

This summary addresses the two air quality indicators - listed under the scenic and natural goals. Because the specific language for either measure has not yet been finalized, the available information for air quality has been summarized for this report.

### **What We Know:**

Over the last decade a great deal has been learned about air quality in the gorge. Air quality monitoring started in the 1990s with two sites operated by the U.S. Forest Service at the east end near Wishram, WA and at the west end on Mt. Zion in eastern Clark County. In 2000 the Gorge Commission adopted an amendment to the Management Plan that called for the protection and enhancement of gorge air quality through the development and implementation of a regional air quality strategy. Since then there has been an increased level of monitoring and directed study by state agencies and the tribes under the leadership of the Yakama Nation. This monitoring has increased understanding of the causes of haze and characteristics of air quality throughout the National Scenic Area. These studies are the building blocks for an overall strategy being developed addressing gorge air quality. Below is a list of these studies and reports and a summary of their purpose:

- Columbia River Gorge Haze Gradient Study (2006): This report was produced for Southwest Clean Air Agency (SWCAA) by the Desert Research Institute. The objectives of the study were to characterize horizontal, vertical and temporal patterns in haze and to gain insight into possible source regions contributing to haze in the gorge.
- Causes of Haze in the Gorge (CoHaGo) Report (2006): This report, also produced for SWCAA by the Desert Research Institute followed the Haze Gradient Study. It was “intended to add to the understanding of the source areas and source types contributing significantly to haze in the Columbia River Gorge in the States of Washington and Oregon.”
- Gorge Emission Inventory Report (2008): The Oregon Department of Environmental Quality (ODEQ) created this list of emission estimates for sources of air pollution that may impact the Scenic Area.
- Gorge CAMx Modeling Report (2007): This report was prepared for SWCAA by ENVIRON International and describes meteorological, emissions and air quality modeling that are used to “assess projected trends in future visibility impairment, to provide a simulation assessment of source apportionment by type and region, and to test several “what-if” scenarios for future year conditions.”
- Gorge Science Summary Report (2008): SWCAA and ODEQ used the above four studies to prepare this report in 2008 summarizing “the results of six years of planning, ambient monitoring and visibility assessment activities to understand and characterize visibility conditions and the causes of visibility impairment in the Columbia River Gorge National Scenic Area.”
- Updated Air Quality Trends for the Columbia River Gorge Report (2006): This report was prepared for Klickitat County by Kent Norville of Air Sciences Inc. to review “air quality data from 1989 to 2005 from various monitors located in and around the Columbia River Gorge (CRG) in order to examine trends in air quality.”

- Analysis of 12 Years of IMPROVE Data in the Columbia River Gorge Report (2006): This report was prepared for the Yakama Nation by Dr. Dan Jaffe of the University of Washington and analyzed a 12-year record of IMPROVE aerosol data from the Wishram, Washington site in the Columbia River Gorge.
- Fog Water Deposition in the Columbia River Gorge Report (2007): This U.S. Forest Service (USFS) study sampled fog, bulk precipitation, throughfall, airborne particulates, and lichen distribution and found that the levels and pH of atmospheric deposition “likely threaten gorge ecosystems and cultural resources.”
- Ozone Injury in West Coast Forests Report (2006): This USFS study looked at the impact that ozone has had on west coast forests, and found ozone damage at a forest site in the National Scenic Area.
- Air Pollution and Climate Gradients in Oregon and Washington Indicated by Epiphytic Macrolichens (2005): This USFS study used lichen as an indicator by modeling lichen community gradients in relationship to air quality, climate and other environmental variables. The model was then applied to an entire dataset to assess regional condition and changes in the lichen community condition over time.
- Analysis of Air Quality Data in the Columbia River Gorge During Temporary Shutdowns at the PGE Boardman Plant (2008): This report was prepared for the Yakama Nation by Dr. Dan Jaffe and analyzed months when the PGE Boardman plant was temporarily shut down allowing quantification of the contribution from the Boardman plant to haze in the Columbia River Gorge.

Other currently ongoing studies are also looking at the contribution of agriculture to air quality degradation and the affects of existing air quality levels on prehistoric rock images (May 2009 release, Yakama Nation).

**Assessment:**

Scientists agree that air quality has been impacted, but have not reached consensus about the trend or the significance of individual sources and their contribution to haze in the gorge. The Gorge Science Summary Report found that visibility impairment in the gorge is typically worse in the winter than it is in the summer, particularly at the eastern end of the National Scenic Area when air stagnation conditions trap and concentrate pollution. Forest Service studies show that gorge haze levels are among the worst for remote area monitoring sites in the Western U.S. Winter haze episodes are dominated by easterly winds with the majority of emissions coming from sources east of the gorge, primarily PGE’s Boardman coal-fired power plant. Winter haze concentrations are most significant at the east end of the gorge, and less significant at the west end of the gorge. Summer haze episodes are dominated by westerly winds with emissions typically coming from the Portland/Vancouver area and other regional sources west of the gorge, or due to wildfires in the region. Summer haze concentrations are most significant at the west end of the gorge, less significant at the east end of the gorge.

The most significant man-made sources contributing to gorge haze were found to include PGE’s Boardman power plant emissions, motor vehicles, non-road emissions (e.g., ships, trains, trucks), agricultural sources of ammonia and woodstoves. Future monitoring work that incorporates the long-term IMPROVE data set with these alternative measurements could benefit the development of indicators of air quality.



## Natural Chapter Endnotes:

### 2.1.a Habitat Quality

Source: EcoVision Report, USFS, 2002.

The US Forest Service 2002 *EcoVision* report describes the functional status of 14 important landscape elements occurring in the Scenic Area. In the context of this report, landscape elements are components of the priority habitats based on the unique species they support and their rarity. Functionality is based on the interruption of landscape flows that can be attributed to disturbance by humans and animals, invasive species encroachment, and the interruption of natural disturbance regimes such as flood, fire, and debris flow.

Landscape elements, physical and biological flows within landscapes, the importance of linkages, the uniqueness of features, and the functional rank of elements were assessed for the report. Forest Service staff relied on their knowledge of the Scenic Area as well as maps depicting landscape features, human development, and the extent of wildlife populations and vegetative cover.

The *EcoVision* Report also contains information on disturbance mechanisms, physical and biological components, and “priority elements” such as threats, ability to influence, uniqueness, ecosystem linkages, and improvement capability for each landscape element. This information was combined with spatial and tabular data and analysis, as well as further consultation with Forest Service scientists to explicitly map landscape elements and function and provide a quantitative assessment of habitat health.

Forty-five significant natural areas were identified using Washington and Oregon Natural Heritage data. Explanation of these determinations is documented in the 1989 report: *Identification of Representative Plant Communities and Botanically Significant Sites in the Columbia River Gorge National Scenic Area*.

### 2.1.c Species Health

Source: Oregon and Washington Natural Heritage Programs.  
<http://www.natureserve.org/explorer/>

Using element occurrence data from the Natural Heritage Programs, species health was determined by averaging the A (assigned a value of 4) through E (assigned a value of 0) rankings made by observers of individual species’ populations. Any species population receiving an average ranking of greater than 2.5 was considered good. It is important to note that element occurrence data is comprised of opportunistic observations. When an observation is reported, it is recorded into the database – with or without an assessment of overall health.

### 2.2.a Surface Water Quality

Sources:

*Sandy River Basin Characterization Report* (Sandy River Basin Working Group, 2005)

*Sandy River Basin Aquatic Restoration Strategy* (Sandy River Working Group, 2007)

*Columbia Tributaries West Watershed Analysis* (USFS 2001)

*Columbia Tributaries East Watershed Analysis* (USFS 1998)

*Western WA Columbia Tributaries Watershed Analysis* (USFS, 2002)

*Technical Memorandum No. 7: Water Quality Report: WRIA 27/28* (LCFRB, 2001)

*Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan Vol. II, Chapter L* (LCFRB, 2004)

*Hood River Columbia Tributaries Subbasin Summary 2000* (Northwest Power Planning Council)  
*Hood River Subbasin Plan, Including Lower Oregon Columbia Gorge Tributaries.* (Prepared for Northwest Power and Conservation Planning Council by the Hood River Soil and Water Conservation District, 2004)  
*Hood River Watershed Action Plan* (2008, Hood River Watershed Group)  
*Mosier Watershed Analysis* (Mosier Watershed Council, 2002)  
*The Dalles Watershed Assessment*, (WCSWCD, 2003 included Rowena Creek)  
*Lower Columbia Salmon Recovery Plan: Wind River* (LCFRB, 2004)  
*WRIA 29 Assessemnt* (2005, Skamania County)  
*Lower Columbia Salmon Recovery Plan: Little White Salmon* (LCFRB, 2004)  
*White Salmon Subbasin Plan* (NWPPCC, 2004)  
 Washington Department of Ecology draft 303(d) list, 2008  
*Catherine Major Creek Watershed Open Space Plan* (USFW, 2005)  
*Klickitat Subbasin Plan* (NPCC, 2004)  
*Fifteenmile Watershed Assessment* (WCSWCD, 2004)  
*Fifteenmile Basin Plan* (NPCC, 2004)  
*The Dalles Watershed Assessment*, (WCSWCD, 2003)  
*Deschutes Subbasin Plan, Assessment* (DCG, 2004)  
*Columbia Gorge Mainstem Subbasin Plan 2004* (ODFW for NWPPCC)  
*Lower Columbia Salmon Recovery & Subbasin Plan* ( NWPPCC, 2004)  
*Columbia River Basin: State of the River Report for Toxics* (EPA, 2009)

Helpful links to watershed reports:

- EPA Columbia River Basin State of the River Report for Toxics:  
<http://yosemite.epa.gov/r10/ECOCOMM.NSF/Columbia/SoRR>
- Washington Department of Ecology Water Quality Assessment and 303(d) Information:  
[http://www.ecy.wa.gov/programs/wq/links/wq\\_assessments.html](http://www.ecy.wa.gov/programs/wq/links/wq_assessments.html)
- Oregon Department of Environmental Quality Water Quality Assessment and 303(d) info:  
<http://www.deq.state.or.us/WQ/assessment/assessment.htm>
- Lower Columbia Fish Recovery Board Watershed Management Plans:  
<http://www.lcfrb.gen.wa.us/Watershed%20planning%20general/Watershed.htm>
- Northwest Power and Conservation Council Sub-basin Plans:  
<http://www.nwcouncil.org/fw/subbasinplanning/Default.htm>
- USGS Oregon Water Science Center: <http://or.water.usgs.gov/>
- Washington Department of Ecology Watershed Resource Inventory Areas:  
<http://www.ecy.wa.gov/apps/watersheds/wriapages/index.html>
- Pacific Northwest Aquatic Monitoring Partnership:  
<http://www.pnamp.org/web/Content.cfm?SectionID=8>
- Columbia River Inter-Tribal Fish Commission (CRITFC) science page:  
<http://www.critfc.org/text/science.html>

- Hood River Watershed Group, Watershed Action Plan and Subbasin Plan [www.hoodriverswcd.org](http://www.hoodriverswcd.org)
- Klickitat County Watershed Management  
<http://www.klickitatcounty.org/NaturalR/default.asp?fD=3>

At this time, no consistent assessment of gorge water quality that addresses the data called for in Indicator 2.2.a exists. The Oregon Department of Environmental Quality has three long term monitoring stations in the NSA (at the mouths of the Sandy, Hood, and Deschutes Rivers) for which it produces a “water quality index” (WQI) measurement that rates water as poor, fair, good or excellent. The Washington Department of Ecology has devised a similar WQI, but none of its monitoring stations are located in the NSA. Subsequently, this report draws on watershed analyses, restoration plans, and other studies and databases addressing water quality in the gorge over the past 15 years. The studies are spotty in coverage, have occurred sporadically and do not use a common language for reporting results.

For this review, a watershed is considered “good” if a) an overall assessment in a reviewed report ranks water quality as generally good or b) the watershed has no listings or issues of concern on the state’s register of impaired water bodies - the 303(d) list. The 303(d) list identifies water bodies with unacceptably high levels of one or more pollutants and/or which do not meet a water quality standard like temperature. The waters of a watershed are considered “impaired” if listed on the state 303(d) list, or a plan for addressing the impairment by setting a Total Maximum Daily Load (TMDL) has been approved by the U.S. Environmental Protection Agency.

### 2.2.b Habitat Quality

Source: Data derived from multiple reports on watershed quality.

Please see the sources listed under 2.2.a above.

At this time no consistent assessment of stream habitat quality that addresses the data called for in Indicator 2.2.a exists. This report draws on watershed analyses, restoration plans, and other studies and databases addressing habitat quality in the gorge over the past 15 years. Data used to characterize watershed characteristics are drawn from a number of primary sources: U.S. Forest Service, Lower Columbia Fish Recovery Board; the Northwest Power & Conservation Council, the Washington Department of Ecology and the Oregon Department of Environmental Quality. Additionally, stakeholder groups such as the Hood River Watershed Group and the Mosier Watershed Council work with the local soil and water conservation districts to produce assessments and action plans.

For this review, a watershed is considered “good” if conditions that allow for watershed functions to occur are present. This includes characteristics such as an uninterrupted flow of wood, water and/or sediment; a low level of development in the active geomorphic features of the stream system, including the riparian buffer zone; and a highly intact riparian forest with a good wood recruitment potential. Watersheds may be characterized as “moderate” if functions are somewhat impacted due to alterations in the watershed, or “impaired” if functions are significantly impacted.

### 2.3.a Air Quality

There are a variety of past and on-going studies looking at gorge air quality. Please see:

Oregon DEQ Gorge Air Quality Project Page: <http://www.deq.state.or.us/aq/gorgeair/>

Southwest Clean Air Agency Gorge Reports Page: <http://www.swcleanair.org/gorgereports.html>

USFS Gorge Air Quality Cam Page: <http://www.fsvisimages.com/cori1/cori1.html>



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