



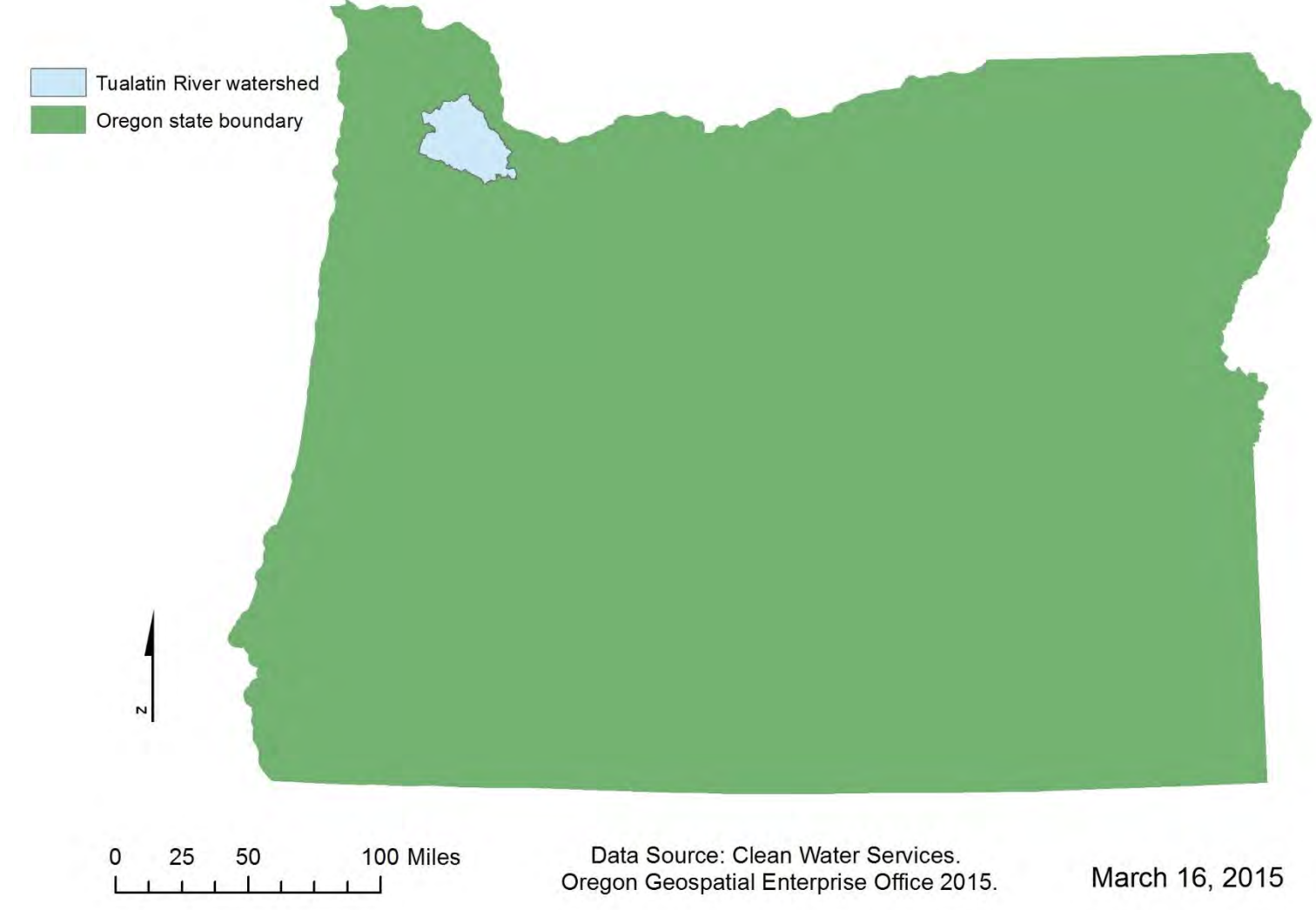
Tualatin River (Source: OregonLive)

The Tualatin River Watershed is in the upper northwest corner of Oregon and drains a 712 square mile area.

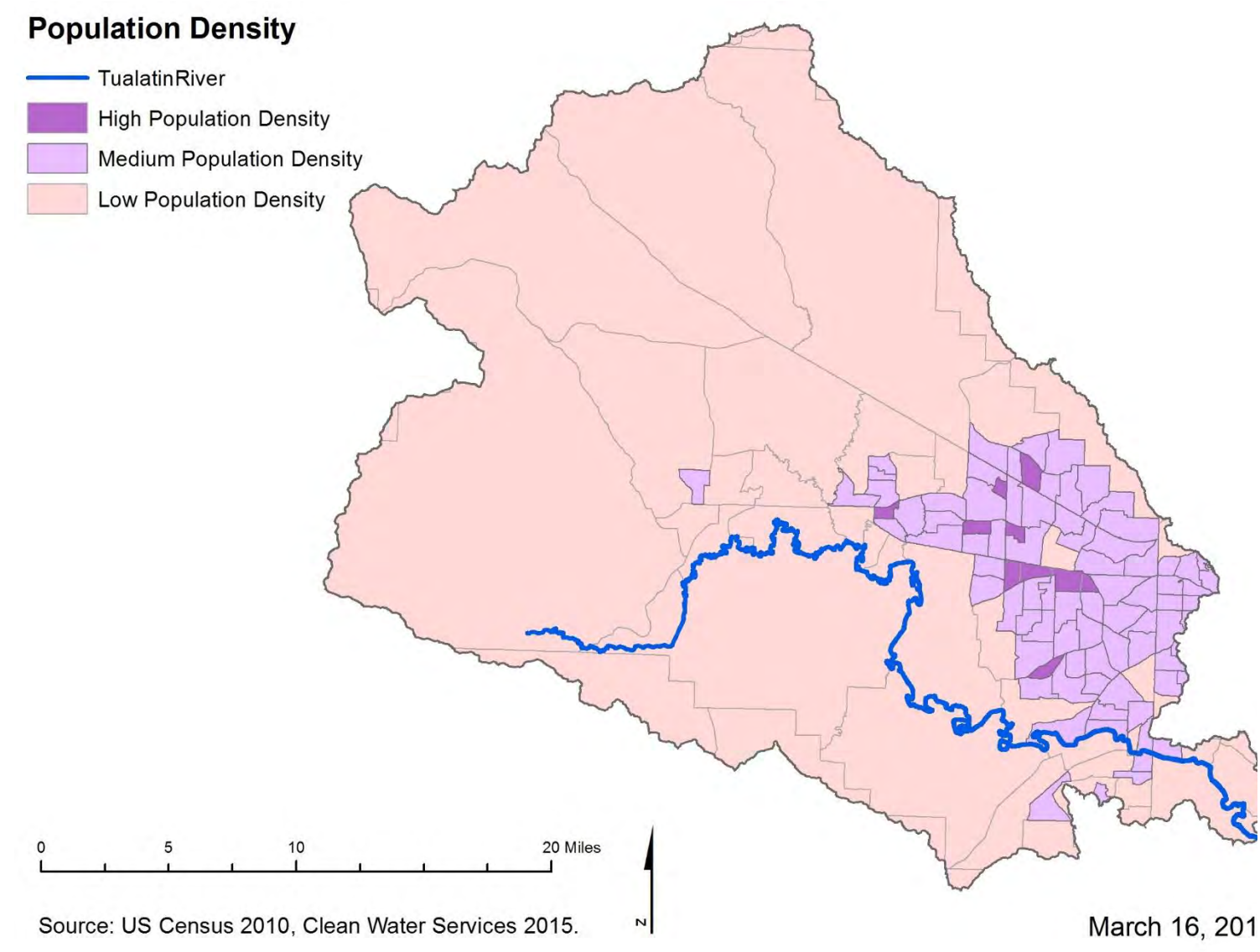
- 27 subbasins
- 39% forest
- 35% agriculture
- 26% urban (EPA 2015)

Water Quality and Impervious Surfaces in the Tualatin

Tualatin River Watershed



Census Population 2010



The Tualatin River was listed as impaired in 2006 by the EPA for at least 67 different contaminants or factors. The chart below shows Total Maximum Daily Loads (TMDL) from October 1995 to March 2015. All 74 have been addressed (EPA 2015).

Cumulative TMDLs by Pollutant Oregon, Tualatin Watershed
This chart includes TMDLs since October 1, 1995.

Pollutant	Number of TMDLs Completed	Number of Causes of Impairment Addressed
Bacteria	23	23
Dissolved Oxygen	21	21
Temperature	17	17
Chlorophyll-A	7	7
Phosphorus	6	6

Purpose

The goal of this project is to evaluate water quality in the Tualatin River Basin between 2005 and 2014 in relation to the Healthy Streams Plan, impervious surfaces, and water quality metrics. The Healthy Streams Plan is a multi-agency community partnership approved in 2005 which includes: stream restoration projects, stream-side tree planting, culvert improvements, flow restoration, and stormwater outfalls. The water quality metrics being examined are turbidity, dissolved oxygen (DO), temperature, and pH.

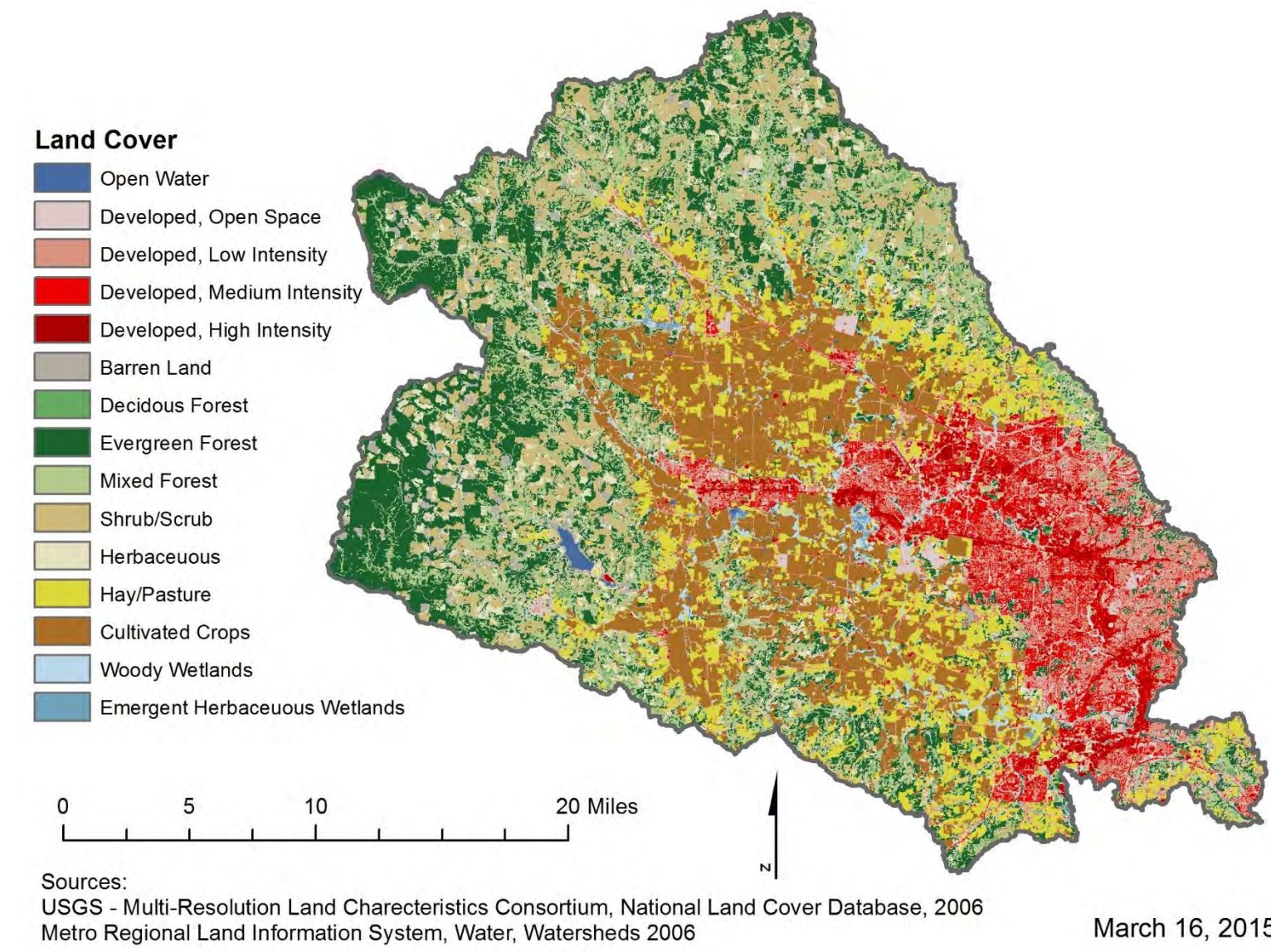
Background

Beginning in 2000 the Tualatin River was analyzed and data was collected to address water quality issues. The Tualatin River was listed in 2006 on the Environmental Protection Agency's 303(d) list of impaired waters due to temperature, bacteria, dissolved oxygen, chlorophyll a, toxics, biological criteria and low pH. Due to the Tualatin River being on the 303(d) list, an interagency effort was implemented to address water quality within the watershed. In 2005, a water quality plan was led by Clean Water Services, to add improvements and features, such as tree planting, to address water quality. Since the plan started, stream improvements have been completed, while some are in progress, and others proposed. Our study was designed to determine if the efforts made by Clean Water Services and other agencies have improved the water quality within the Tualatin Watershed.

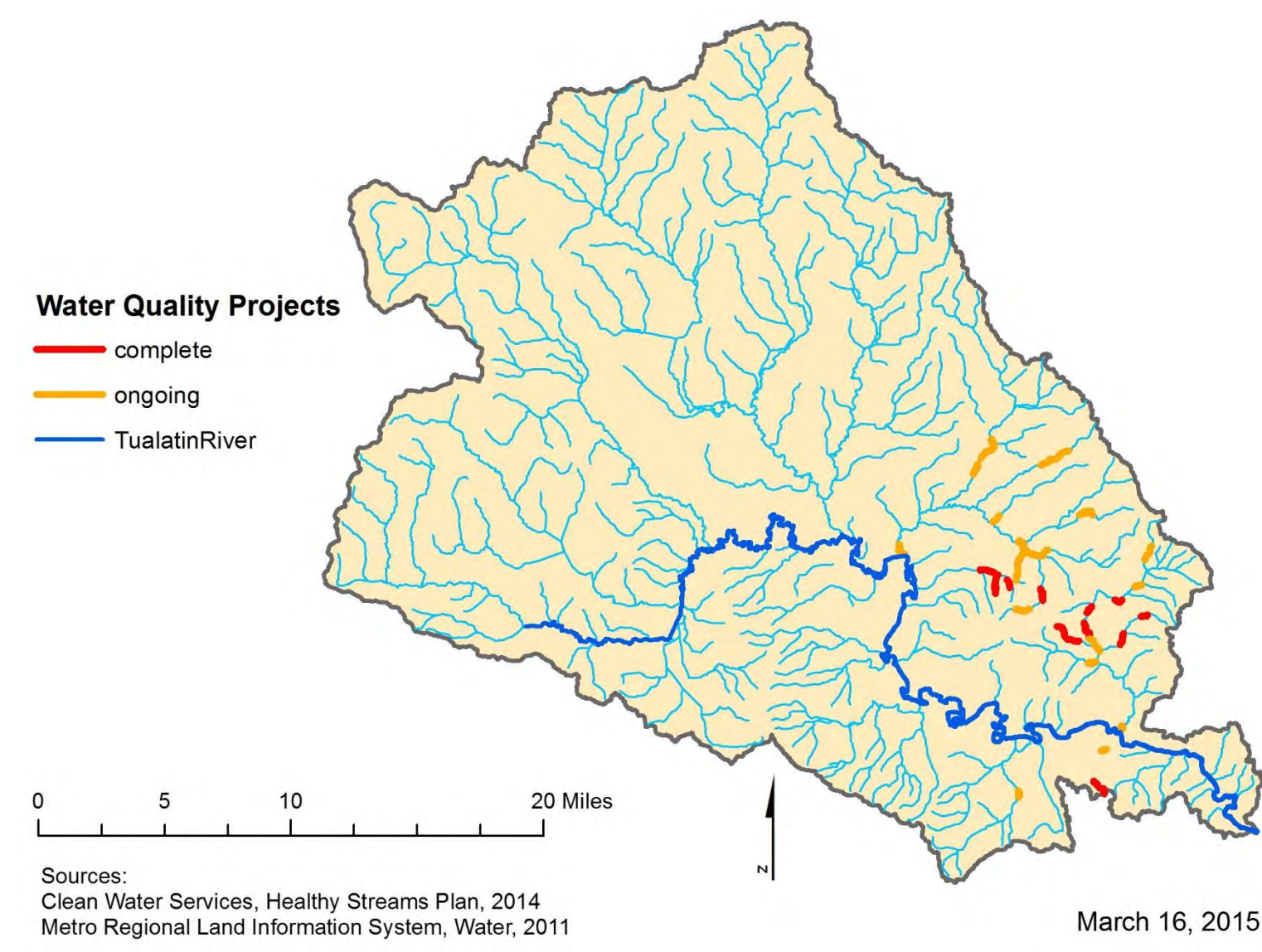
(CWS 2015, EPA 2015).
Methodology

Data on the Healthy Streams Plan was gathered from various organizations working on water quality monitoring and improvements in the Tualatin River watershed. Water quality information from where the Tualatin River flows out of the basin was then compared against land cover and impervious surface data from 2006 and 2011 in order to relate water quality metrics to the percent increase in impervious surfaces and changes in land cover. ArcGIS zonal statistics were ran on landcover and impervious data. Population was reclassified into three groups. Water quality metrics being examined were turbidity, pH, temperature, and dissolved oxygen.

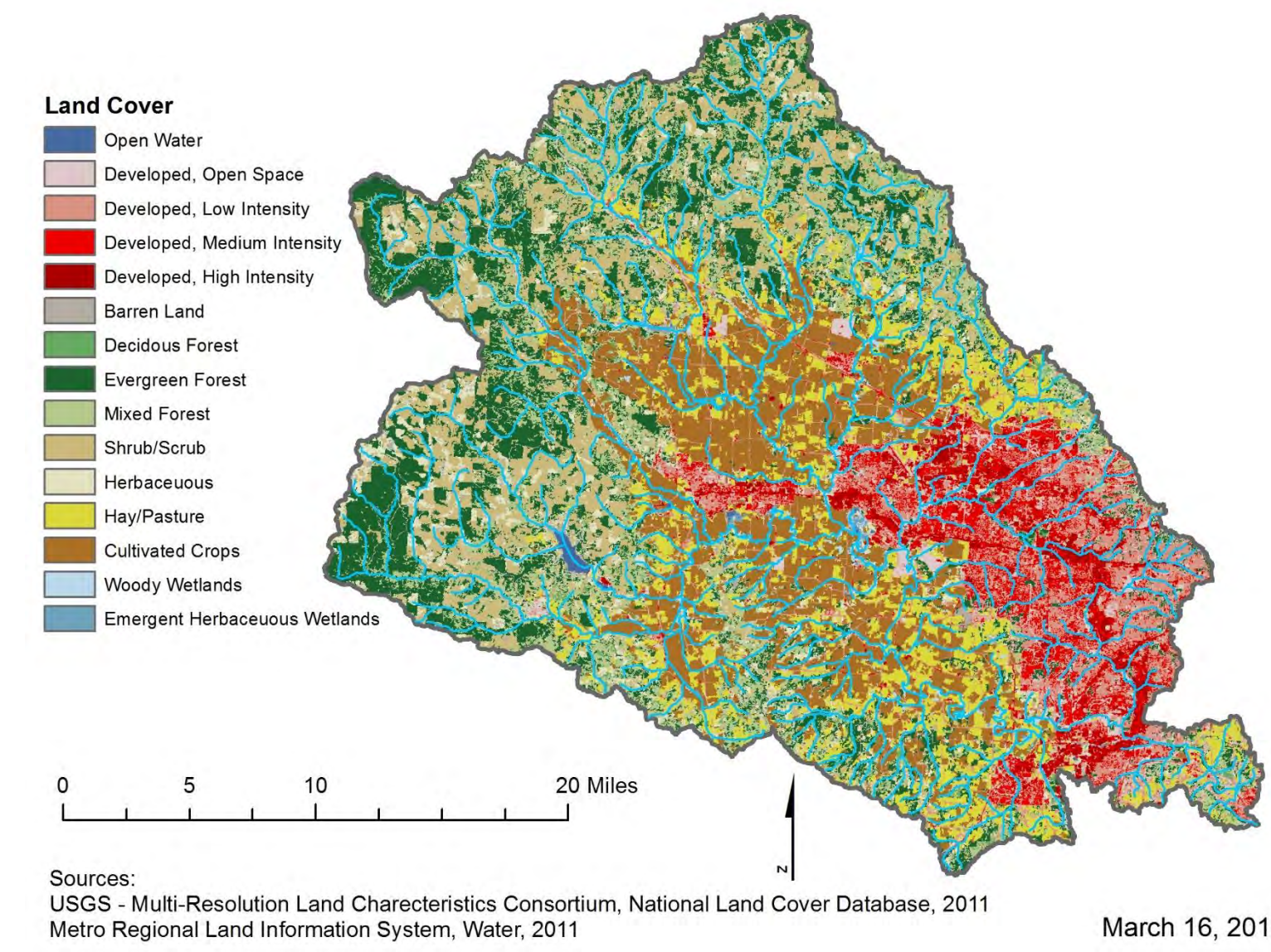
Land Cover 2006



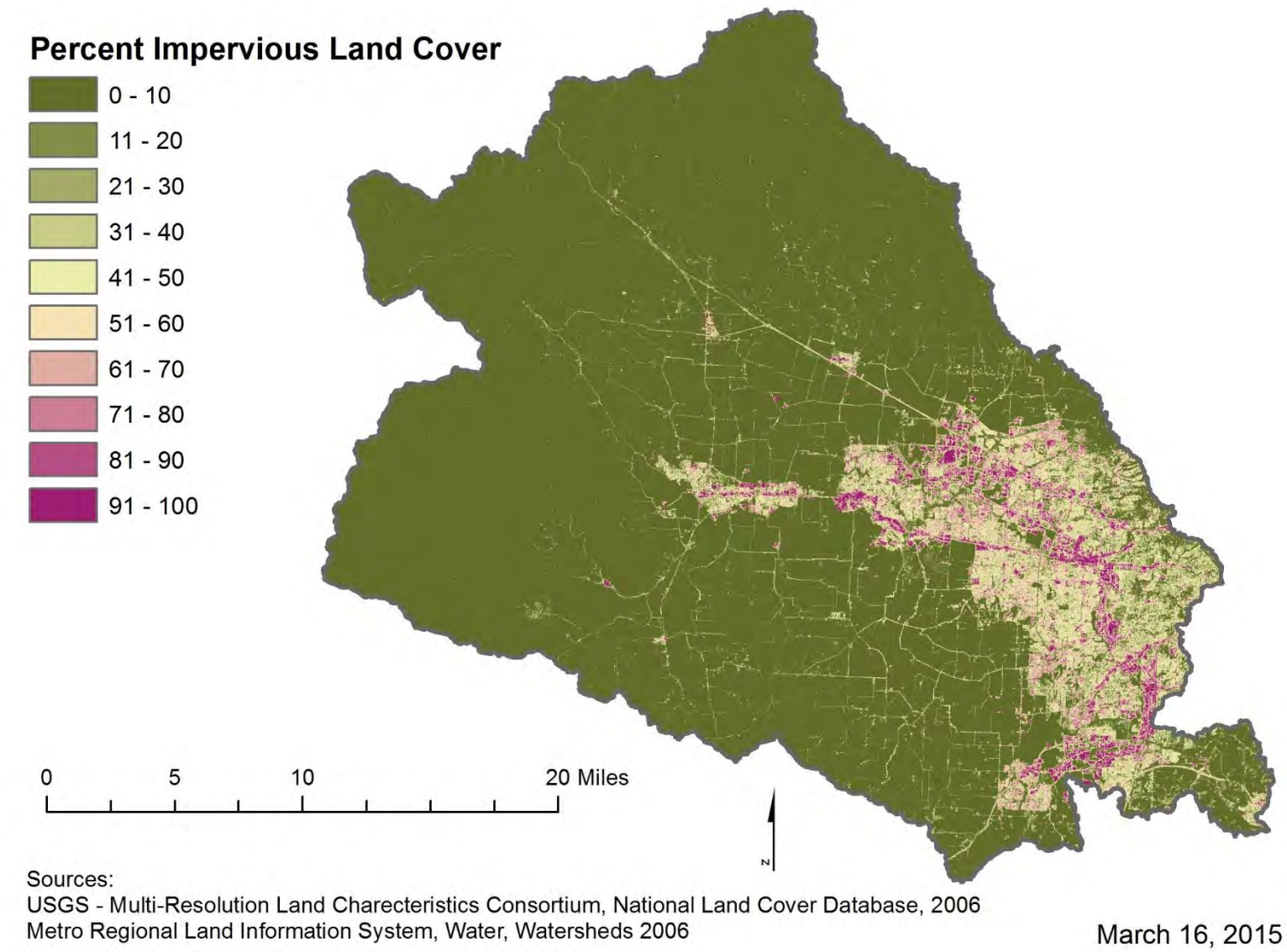
Healthy Streams Plan Projects



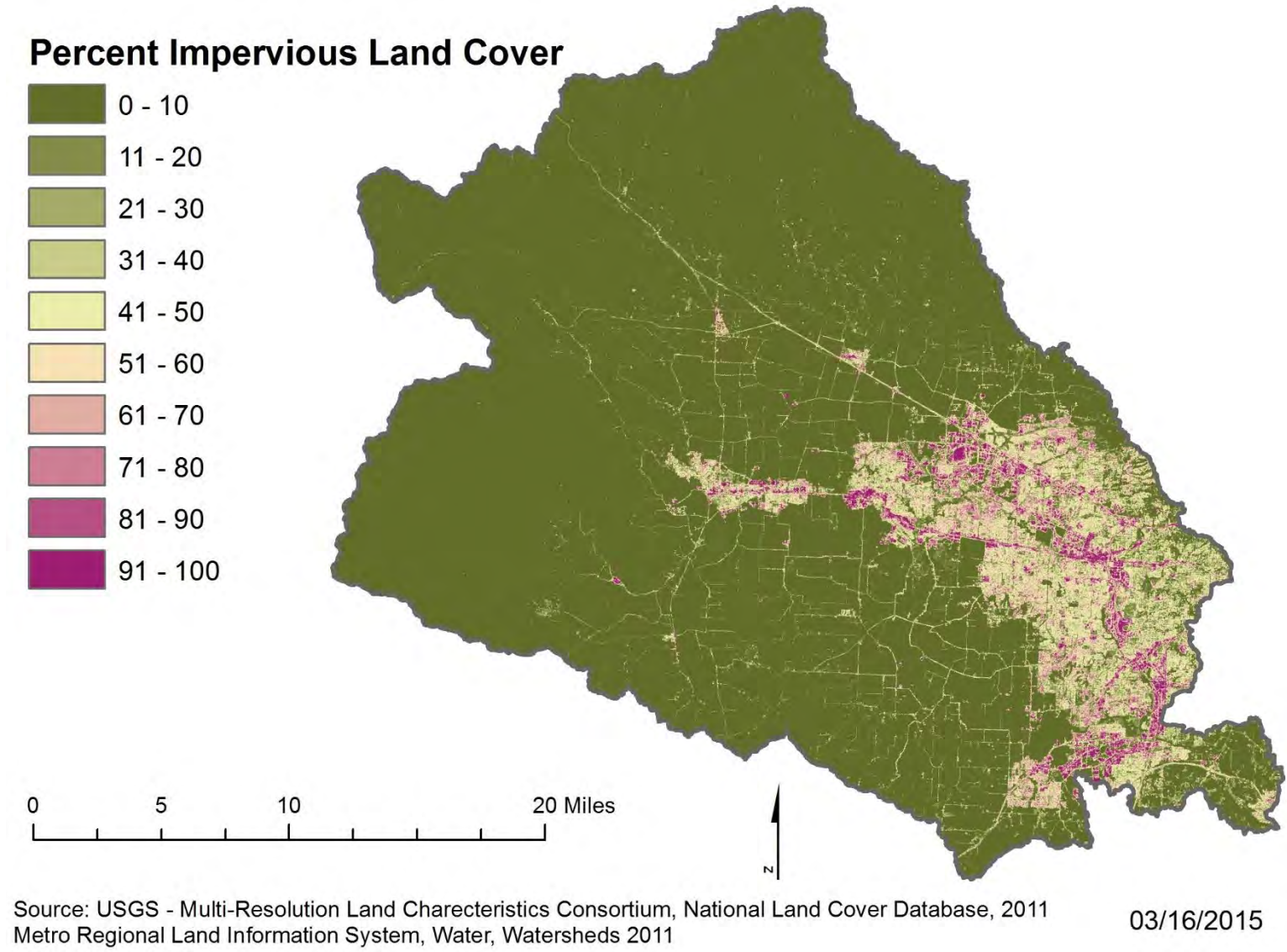
Land Cover 2011



Impervious Surface Percent 2006



Impervious Surface Percent 2011



Impervious Surfaces and Runoff

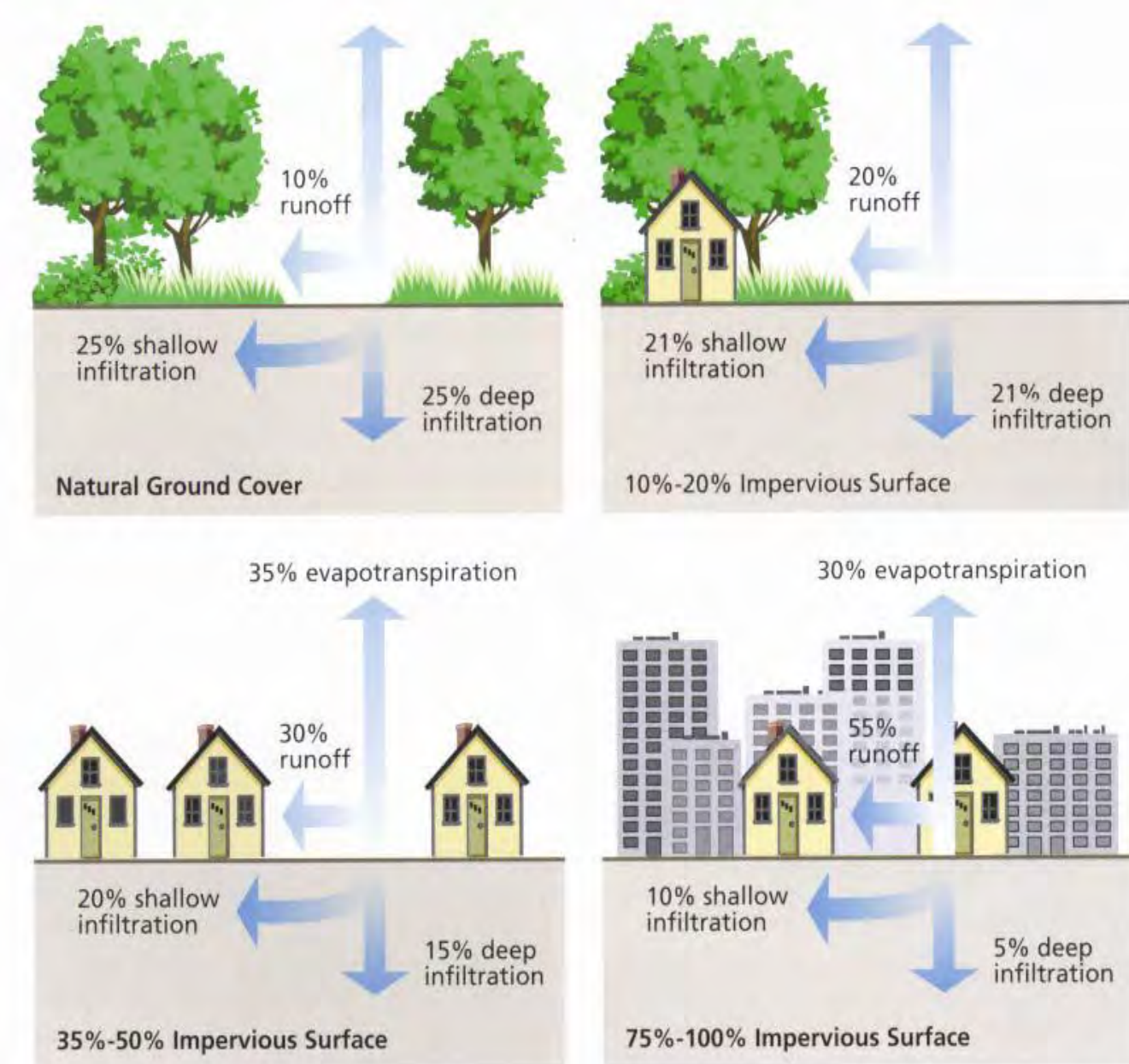


Image Source: Clean Water Services 2002.

Data Sources

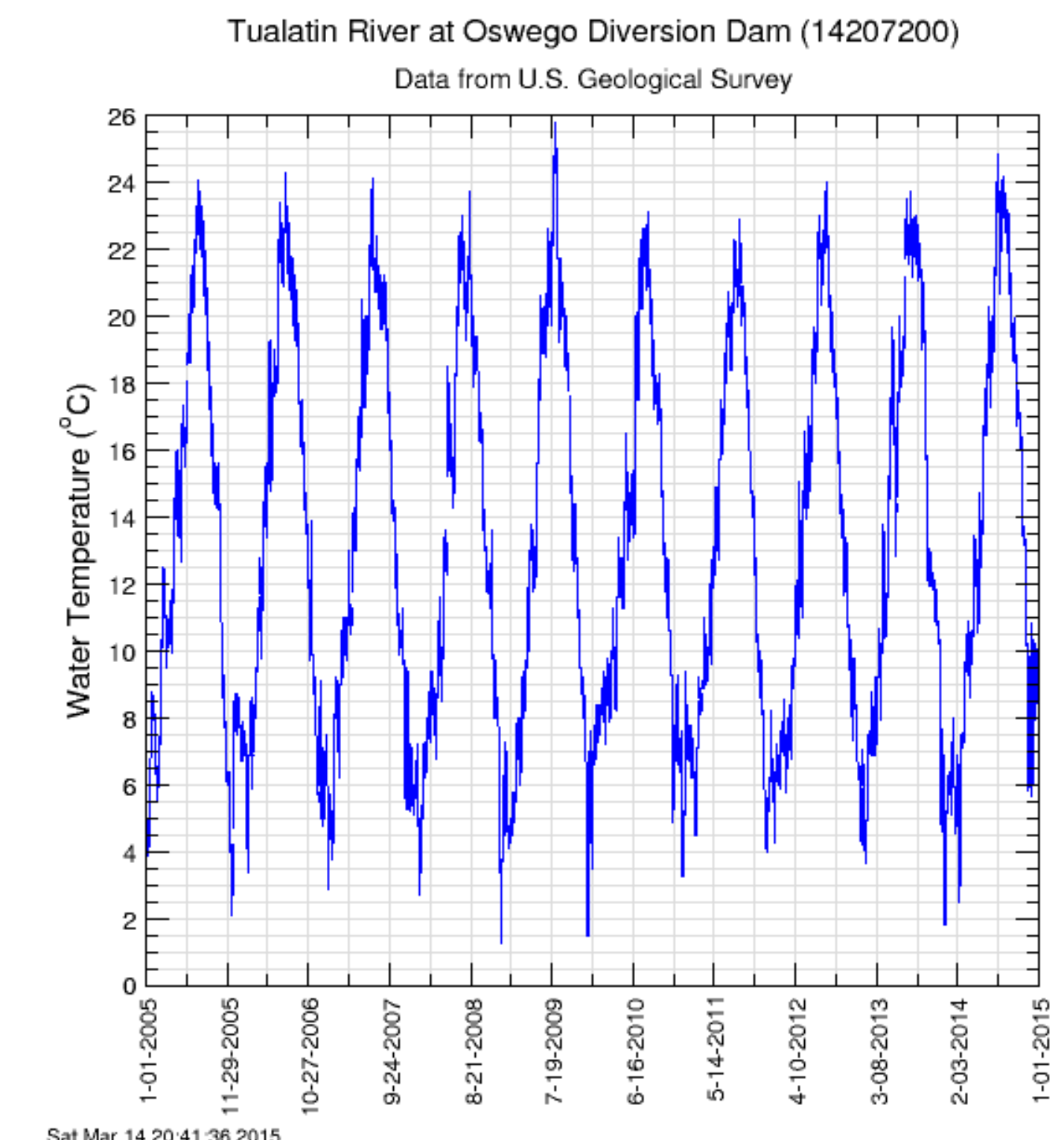
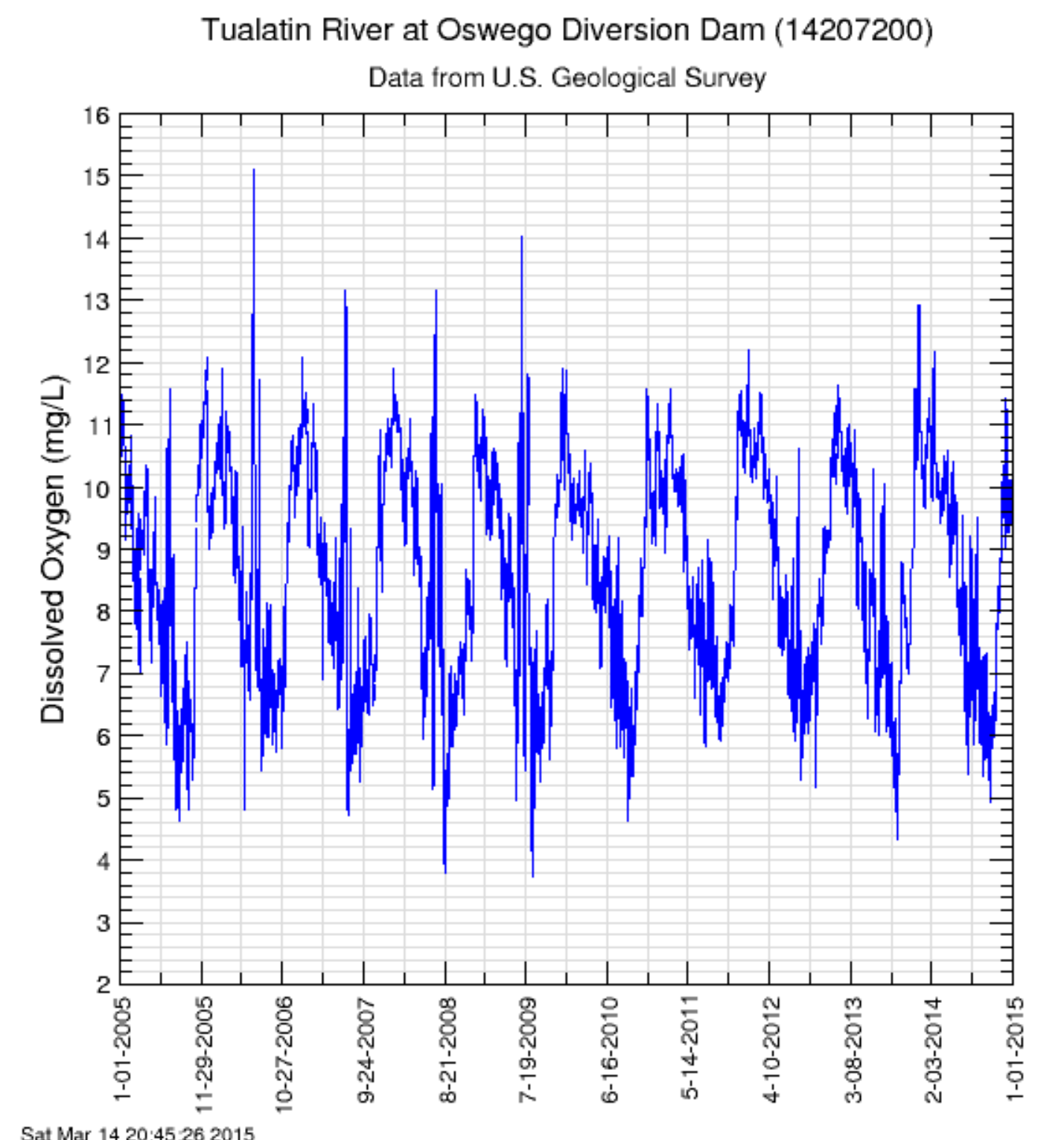
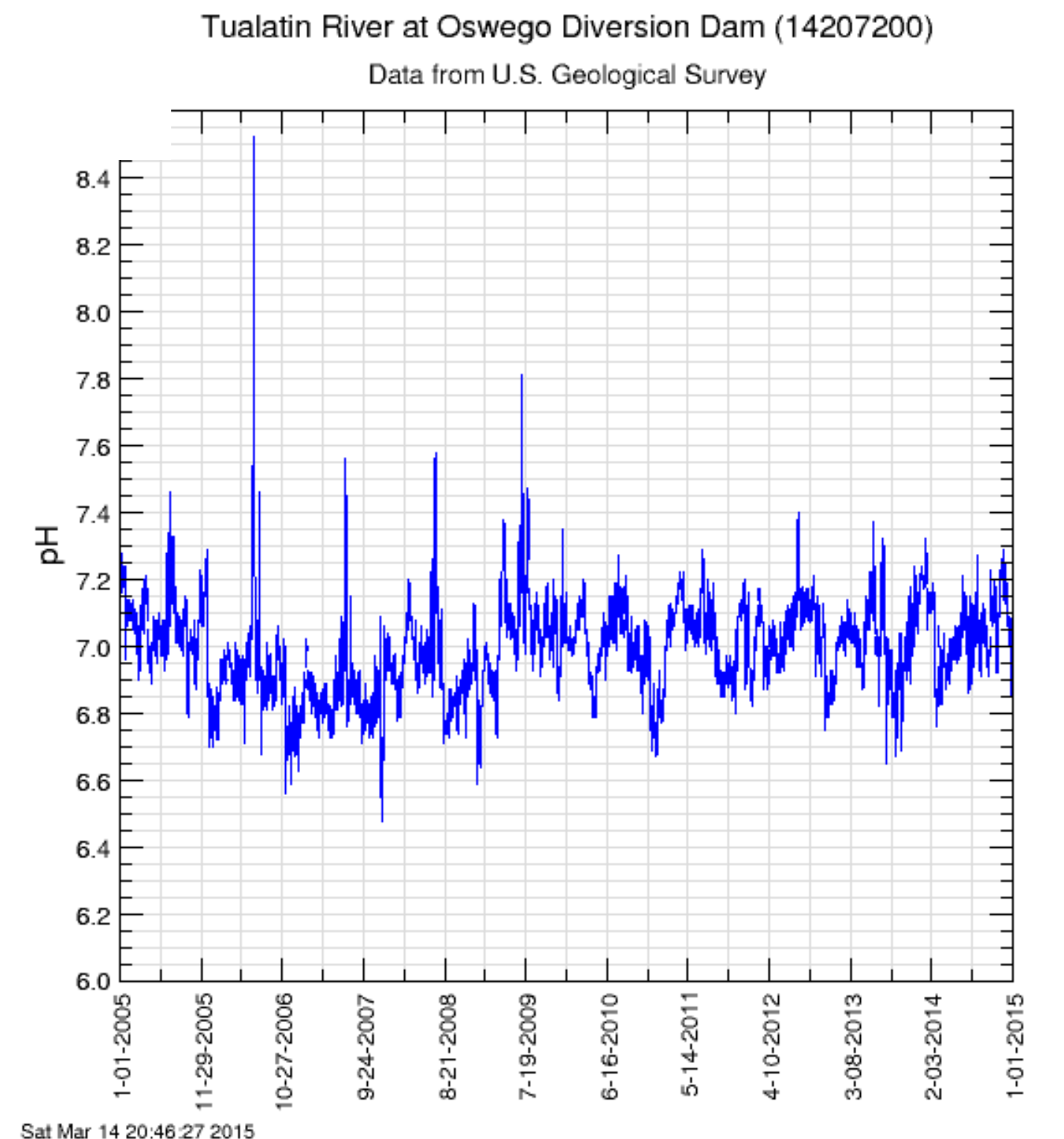
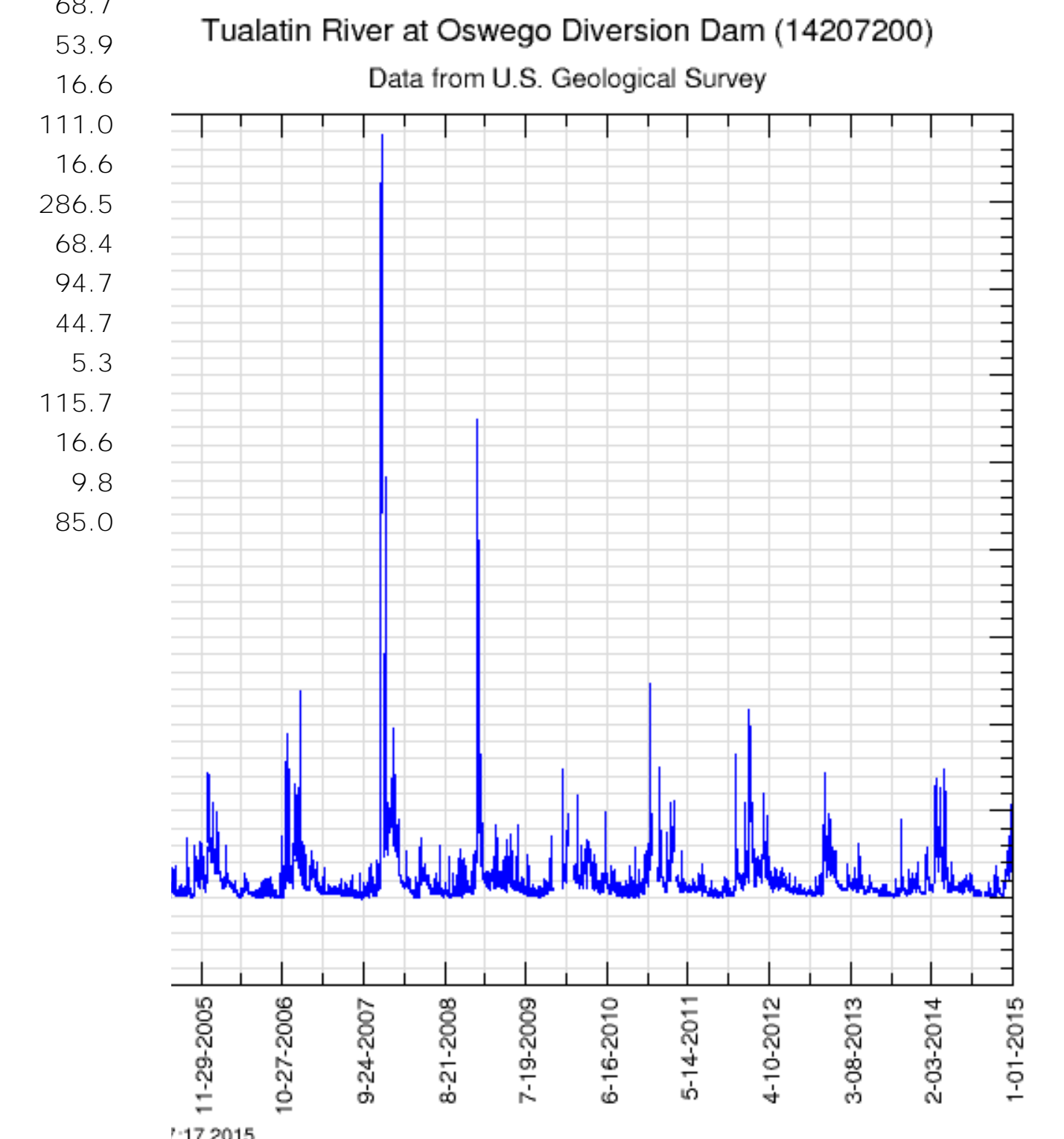
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Discussion

In 2004 Clean Water Services (CWS) acquired a watershed-based pollution trading permit that gave water quality credits for riparian planting. This led to their approval of the *Healthy Stream Plan* in 2005. Many agencies partnered with the Healthy Streams Plan or were a part of other agency collaborations focused on improving water quality in the Tualatin River Basin. Because so many agencies were involved in various projects, credit for the improved watershed health can be seen as a multi-agency success story that Clean Water Services and the Healthy Streams Plan were a part of. In 2011 a seasonal Kendall trend test on water samples from 1991 to 2011 on total phosphorus, bacteria and chlorophyll showed significant reductions. The EPA talks about the improvements in water quality in the Tualatin River watershed as a watershed success story (EPA 2015, CWS 2015).

Conclusion

In our analysis we found that water quality has improved since 2006, and the Tualatin River has been de-listed from the EPA's list of impaired waters. We found that since Clean Water Services started their Healthy Streams Plan, that water quality has improved in dissolved oxygen, temperature, turbidity, and pH. We found that the increase in impervious surfaces within the Tualatin Watershed has increased by 1.4% from 2006 to 2011. Despite this increase in impervious surface, which has been correlated to have a negative impact on surrounding stream, the water quality within the Tualatin Watershed has improved. This leads us to believe that the Healthy Streams Plan has been effective in improving the overall water quality of the Tualatin Watershed.



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Alaina Melville
Jeremy Bigelow
Mitch Attig