National Groundwater Monitoring Network (NGWMN) Data Providers Meeting, Las Vegas

December 2016

Kirk Sinclair

DEPARTMENT OF ECOLOGY
State of Washington

DEPARTMENT OF ECOLOGY
State of Washington

About us | Contact us

Home | Water Quality & Supply | Waste & Toxics | Air & Climate | Cleanup & Spills

Ecology Programs

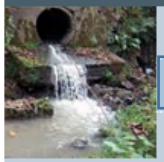
ECOLOGY PROGRAMS

- Air Quality
- Environmental Assessment
- Hazardous Waste & Toxics Reduction
- Nuclear Waste
- Shorelands & Environmental Assistance
- Spills
- Toxics Cleanup
- Waste 2 Resources
- Water Quality
- Water Resources

Also see Ecology Services

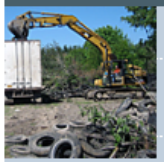
Ecology consists of ten major environmental management programs. If you are not familiar with Ecology's statutory authorities and organization, the Services page may be more helpful.

Water Quality & Supply



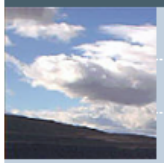
- Water Quality Program
- Water Resources Program
- Shorelands & Environmental Assistance Program
- Office of the Columbia River
- Environmental Assessment Program

Waste & Toxics



- Waste 2 Resources Program
- Hazardous Waste & Toxics Reduction Program
- Nuclear Waste Program
- Environmental Assessment Program

Air & Climate



- Air Quality Program
- Climate Change

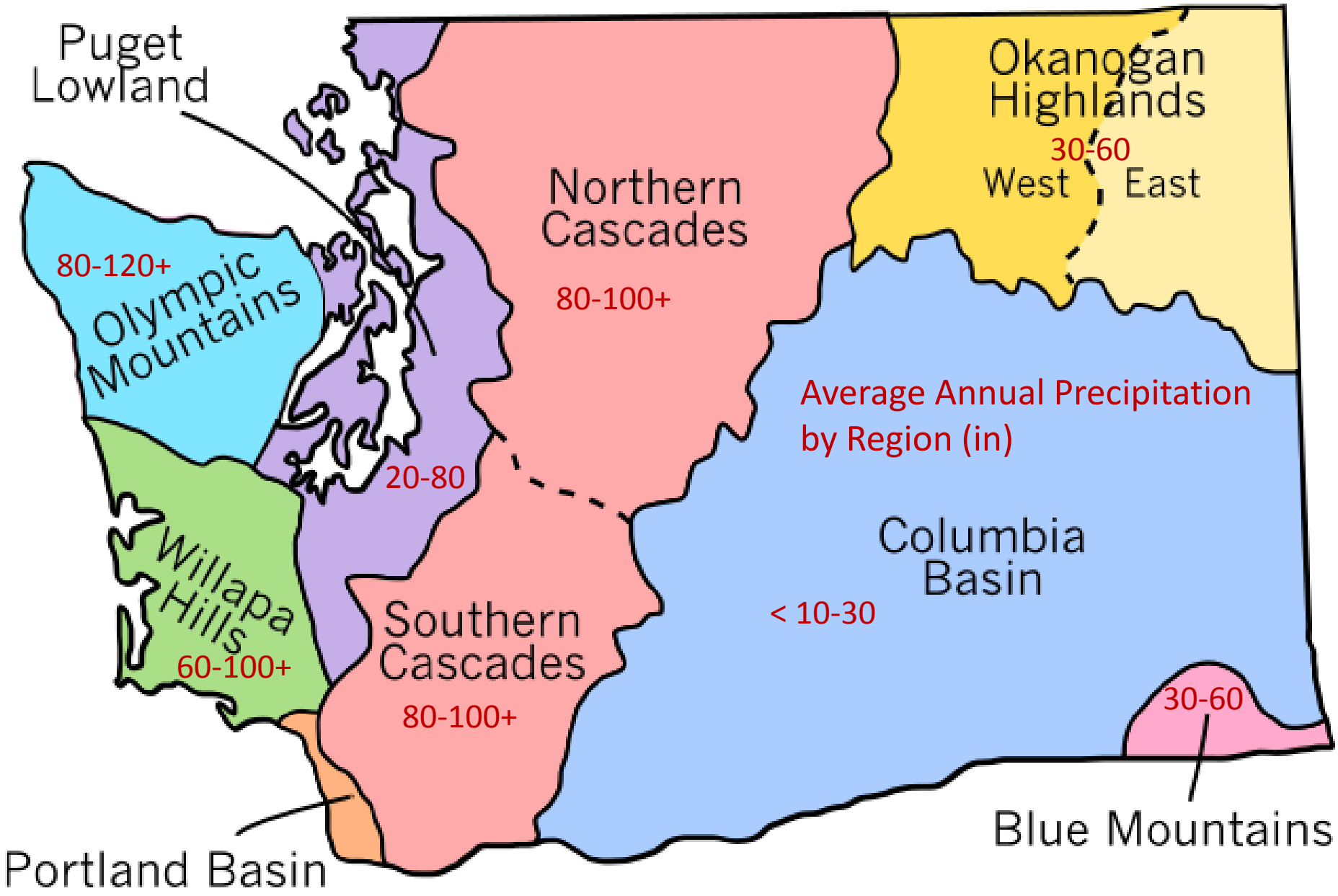
Cleanup & Spills

- Toxics Cleanup Program
- Spills Program
- Nuclear Waste Program

Feedback?

Ecology's NGWMN contributors

Physiographic regions of Washington



A Quick Overview of Ecology's Environmental Information Management (EIM) system

Search:

ALL — Studies + Locations + Results

Studies — Example: Study ID AODE6815

Locations — Example: Nooksack River

Results — Example: Copper

Search does not include physical habitat data - see Watershed Health below.

Search Focus Areas within EIM

Focus Areas are specific datasets within EIM. All data below is in EIM Search above, except physical habitat data.

Groundwater Data Center Groundwater-specific search and tools for those interested only in groundwater quality and levels. Does not contain other media, except well boring soil data.

More info | Get Data

Ecology Monitoring Programs Data collected by Ecology and affiliates with specific monitoring objectives; usually long-term and regularly-scheduled, using consistent protocols. Each Monitoring Program only contains data from the EIM Studies associated with it.

Watershed Health

Physical habitat, biological field, and chemistry data; physical and biological metrics. Includes only EIM Studies with habitat data, 2009 to present

More info | Get Data

BEACH Program

Weekly bacteria data from Puget Sound and coastal beaches, Memorial Day through Labor Day, 2004 to present

More info | Get Data

Marine Sediments

Chemistry, bioassay, and benthic invertebrate data measuring Puget Sound sediment quality, 1989 to present

More info | Get Data

River and Stream Water Quality

Monthly water quality monitoring at hundreds of stream stations, 1960s to present

More info | Get Data

Freshwater Fish Contaminants

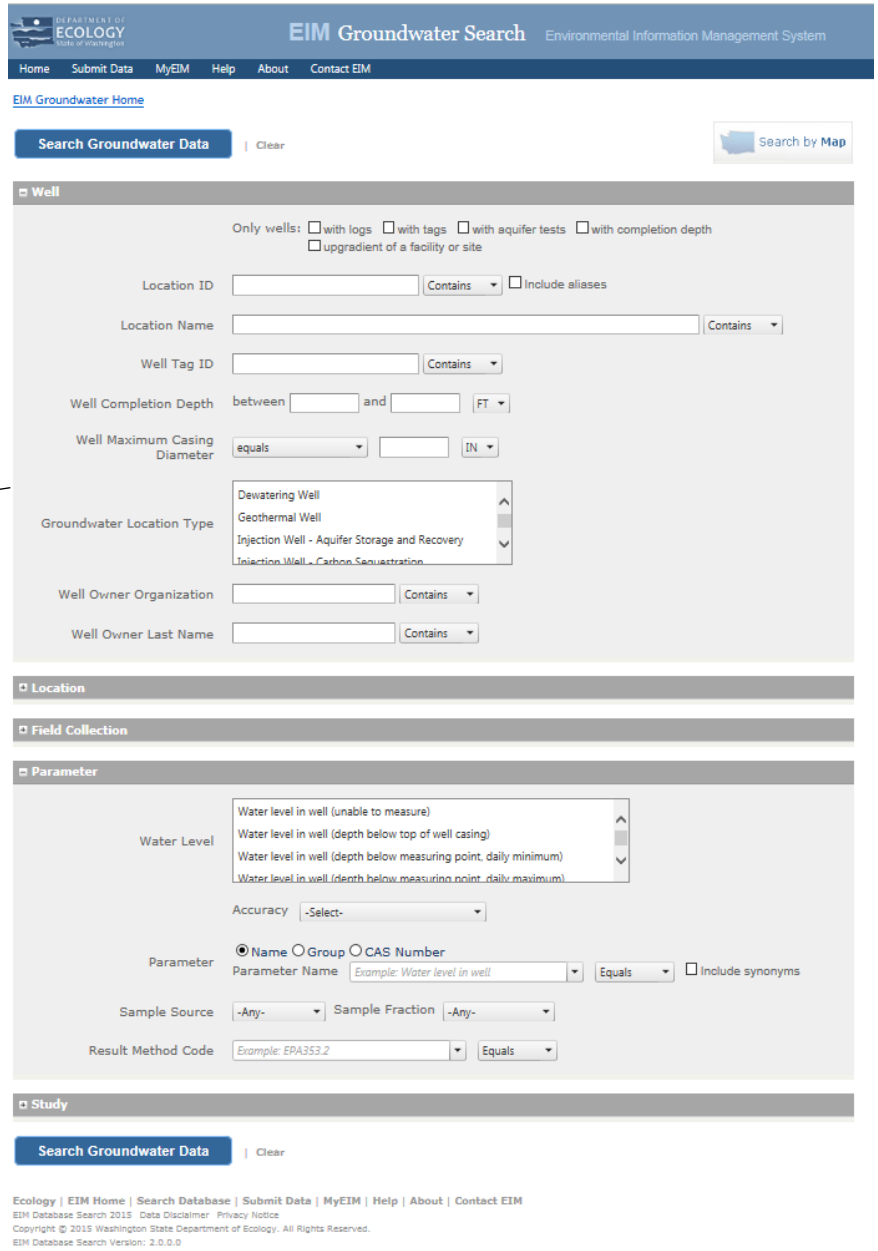
Characterization of toxic chemicals in freshwater fish, 2001 to present

More info | Get Data

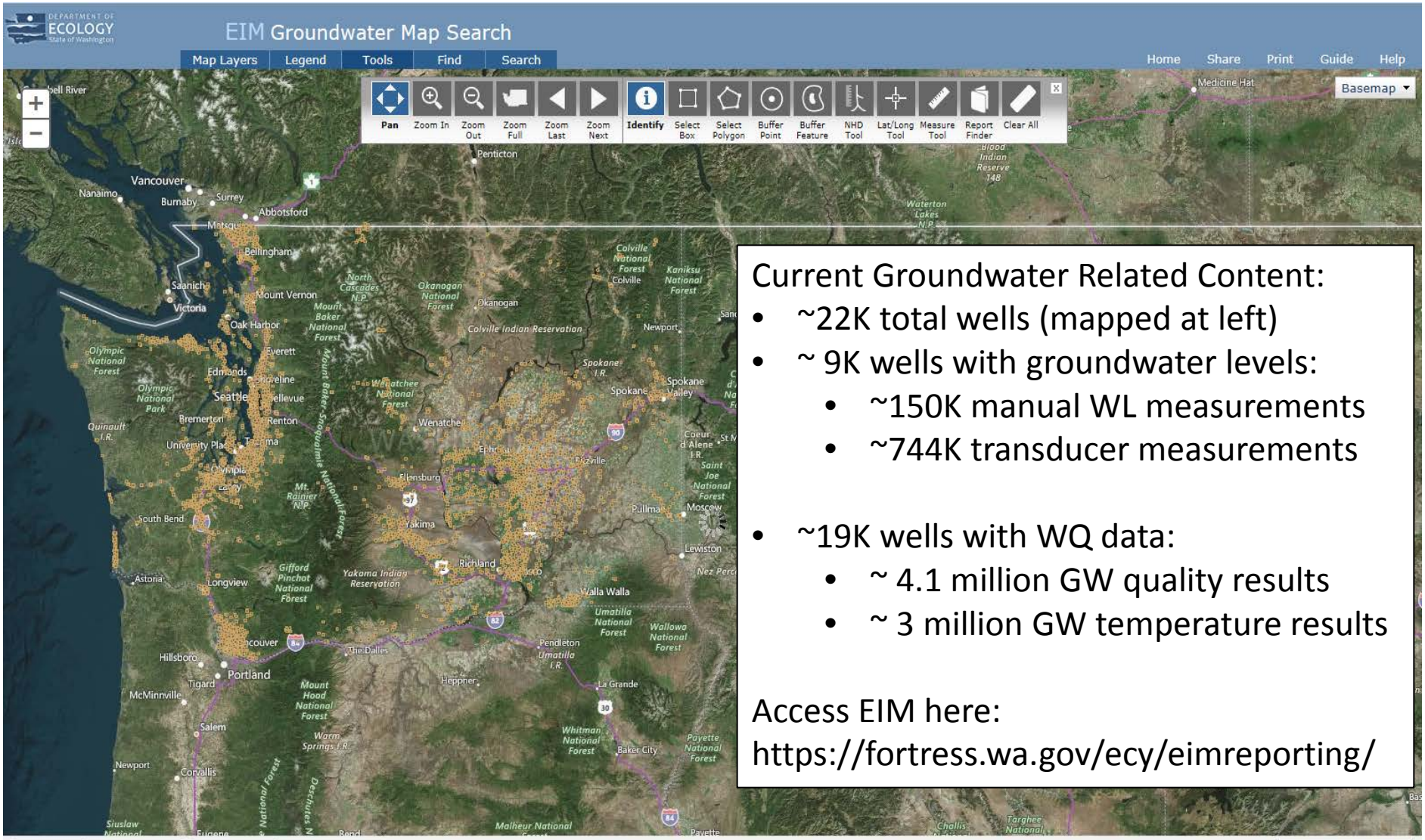
Persistent, Bioaccumulative Toxics (PBTs)

Assessment of PBTs in environmental media, including mercury in fish and organic PBTs in sediment cores, 2005 to present

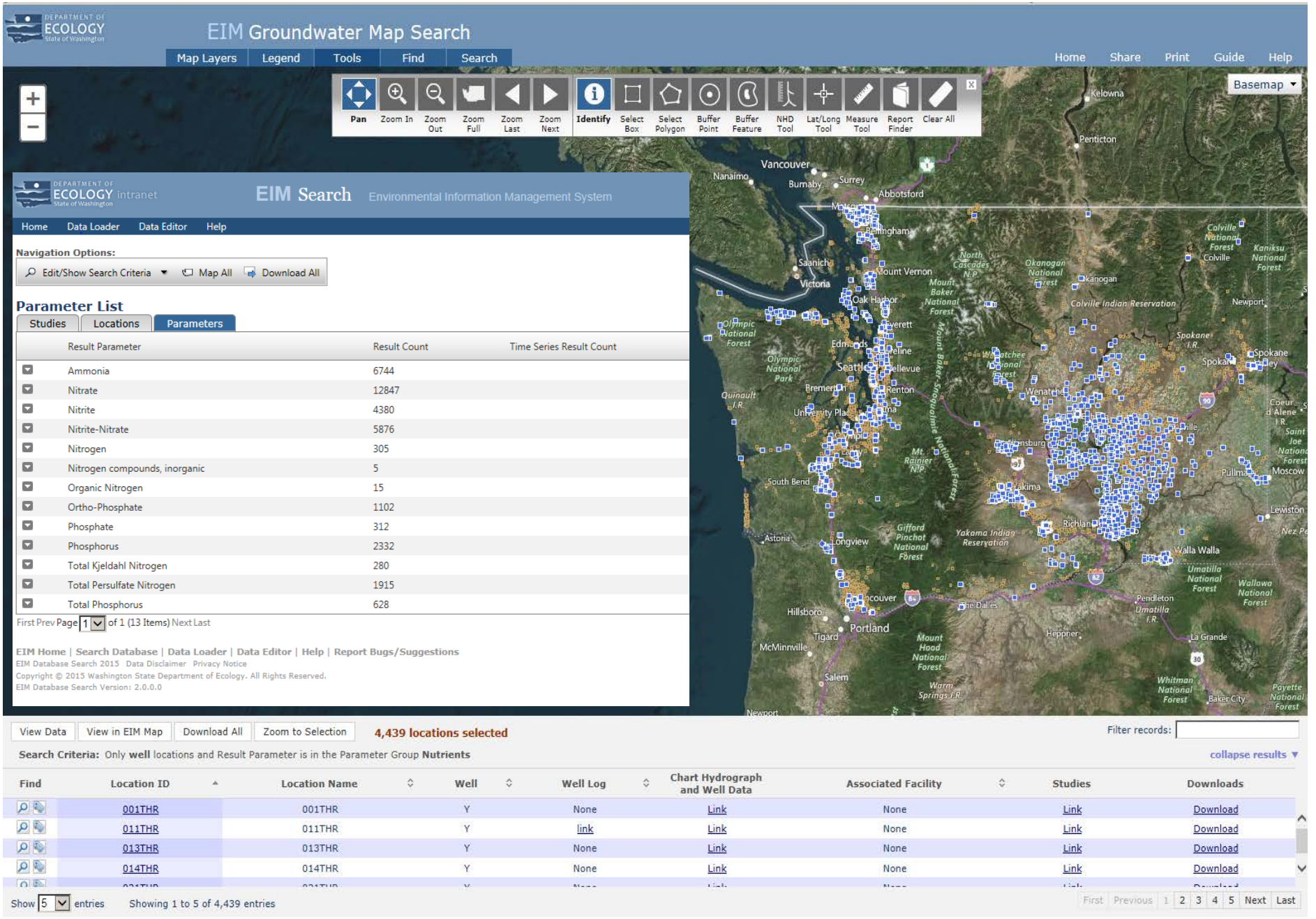
More info | Get Data



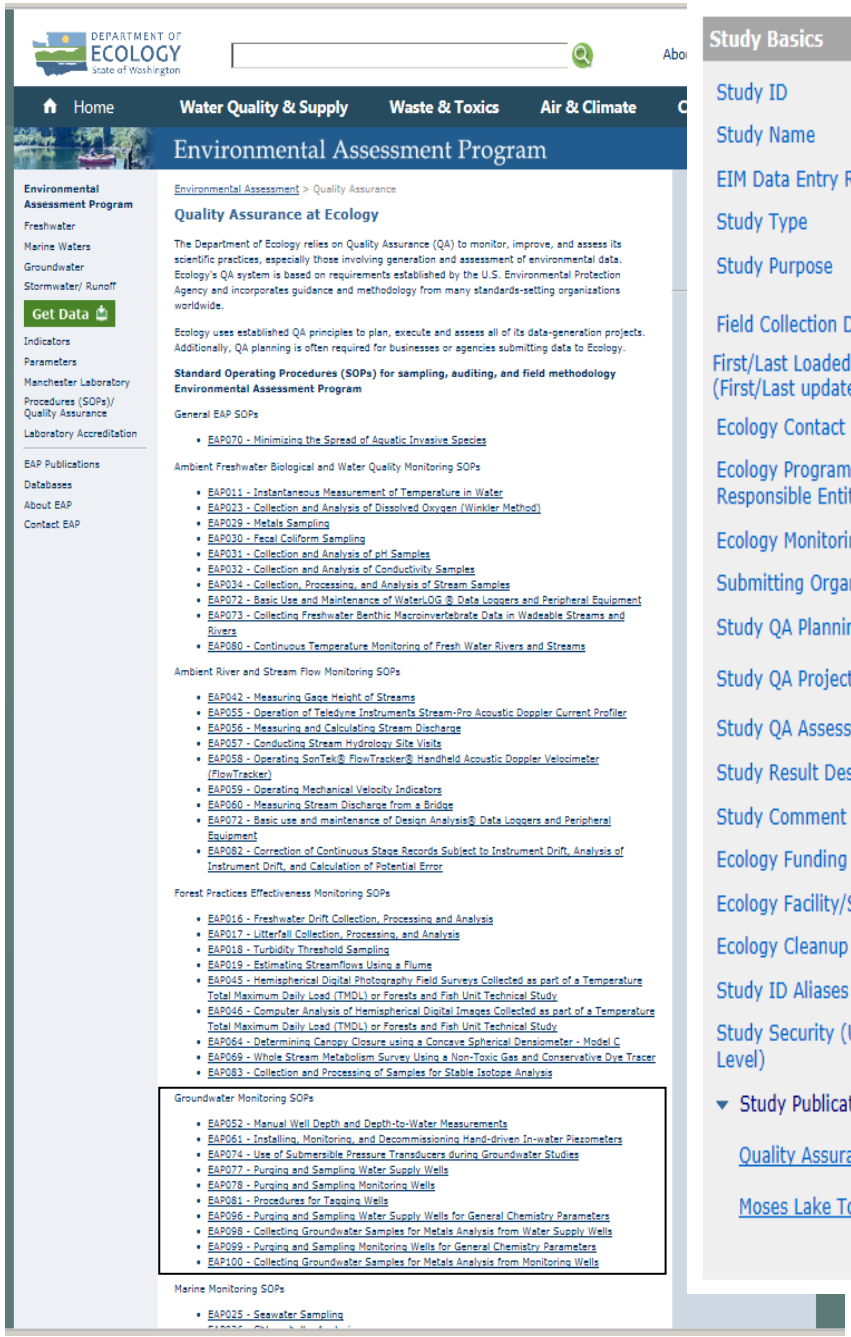
The EIM Groundwater "Module"



Example query return: wells that have been sampled for parameter group “Nutrients”



Ecology's Data Collection Methods .....and Quality Assurance Protocols



DEPARTMENT OF ECOLOGY State of Washington

Home | Water Quality & Supply | Waste & Toxics | Air & Climate

Environmental Assessment Program

Environmental Assessment > Quality Assurance

Environmental Assessment Program
Freshwater
Marine Waters
Groundwater
Stormwater/ Runoff
Get Data
Indicators
Parameters
Manchester Laboratory
Procedures (SOPs)/ Quality Assurance
Laboratory Accreditation
EAP Publications
Databases
About EAP
Contact EAP

Quality Assurance at Ecology

The Department of Ecology relies on Quality Assurance (QA) to monitor, improve, and assess its scientific practices, especially those involving generation and assessment of environmental data. Ecology's QA system is based on requirements established by the U.S. Environmental Protection Agency and incorporates guidance and methodology from many standards-setting organizations worldwide.

Ecology uses established QA principles to plan, execute and assess all of its data-generation projects. Additionally, QA planning is often required for businesses or agencies submitting data to Ecology.

Standard Operating Procedures (SOPs) for sampling, auditing, and field methodology Environmental Assessment Program

General EAP SOPs

- EAP070 - Minimizing the Spread of Aquatic Invasive Species

Ambient Freshwater Biological and Water Quality Monitoring SOPs

- EAP011 - Instantaneous Measurement of Temperature in Water
- EAP023 - Collection and Analysis of Dissolved Oxygen (Winkler Method)
- EAP029 - Metals Sampling
- EAP030 - Fecal Coliform Sampling
- EAP031 - Collection and Analysis of pH Samples
- EAP032 - Collection and Analysis of Conductivity Samples
- EAP034 - Collection, Processing, and Analysis of Stream Samples
- EAP072 - Basic Use and Maintenance of WaterLOG ® Data Loggers and Peripheral Equipment
- EAP073 - Collecting Freshwater Benthic Macroinvertebrate Data in Wadeable Streams and Rivers
- EAP080 - Continuous Temperature Monitoring of Fresh Water Rivers and Streams

Ambient River and Stream Flow Monitoring SOPs

- EAP042 - Measuring Gage Height of Streams
- EAP055 - Operation of Teledyne Instruments Stream-Pro Acoustic Doppler Current Profiler
- EAP056 - Measuring and Calculating Stream Discharge
- EAP057 - Conducting Stream Hydrology Site Visits
- EAP058 - Operating SonTek® FlowTracker® Handheld Acoustic Doppler Velocimeter (FlowTracker)
- EAP059 - Operating Mechanical Velocity Indicators
- EAP060 - Measuring Stream Discharge from a Bridge
- EAP072 - Basic use and maintenance of Design Analysis® Data Loggers and Peripheral Equipment
- EAP082 - Correction of Continuous Stage Records Subject to Instrument Drift, Analysis of Instrument Drift, and Calculation of Potential Error

Forest Practices Effectiveness Monitoring SOPs

- EAP016 - Freshwater Drift Collection, Processing and Analysis
- EAP017 - Litterfall Collection, Processing, and Analysis
- EAP018 - Turbidity Threshold Sampling
- EAP019 - Estimating Streamflows Using a Flume
- EAP045 - Hemispherical Digital Photography Field Surveys Collected as part of a Temperature Total Maximum Daily Load (TMDL) or Forests and Fish Unit Technical Study
- EAP046 - Computer Analysis of Hemispherical Digital Images Collected as part of a Temperature Total Maximum Daily Load (TMDL) or Forests and Fish Unit Technical Study
- EAP064 - Determining Canopy Closure using a Concave Spherical Densiometer - Model C
- EAP069 - Whole Stream Metabolism Survey Using a Non-Toxic Gas and Conservative Dye Tracer
- EAP083 - Collection and Processing of Samples for Stable Isotope Analysis

Groundwater Monitoring SOPs

- EAP052 - Manual Well Depth and Depth-to-Water Measurements
- EAP061 - Installing, Monitoring, and Decommissioning Hand-driven In-water Piezometers
- EAP074 - Use of Submersible Pressure Transducers during Groundwater Studies
- EAP077 - Purging and Sampling Water Supply Wells
- EAP078 - Purging and Sampling Monitoring Wells
- EAP081 - Procedures for Tagging Wells
- EAP096 - Purging and Sampling Water Supply Wells for General Chemistry Parameters
- EAP098 - Collecting Groundwater Samples for Metals Analysis from Water Supply Wells
- EAP099 - Purging and Sampling Monitoring Wells for General Chemistry Parameters
- EAP100 - Collecting Groundwater Samples for Metals Analysis from Monitoring Wells

Marine Monitoring SOPs

- EAP025 - Seawater Sampling

Study Basics

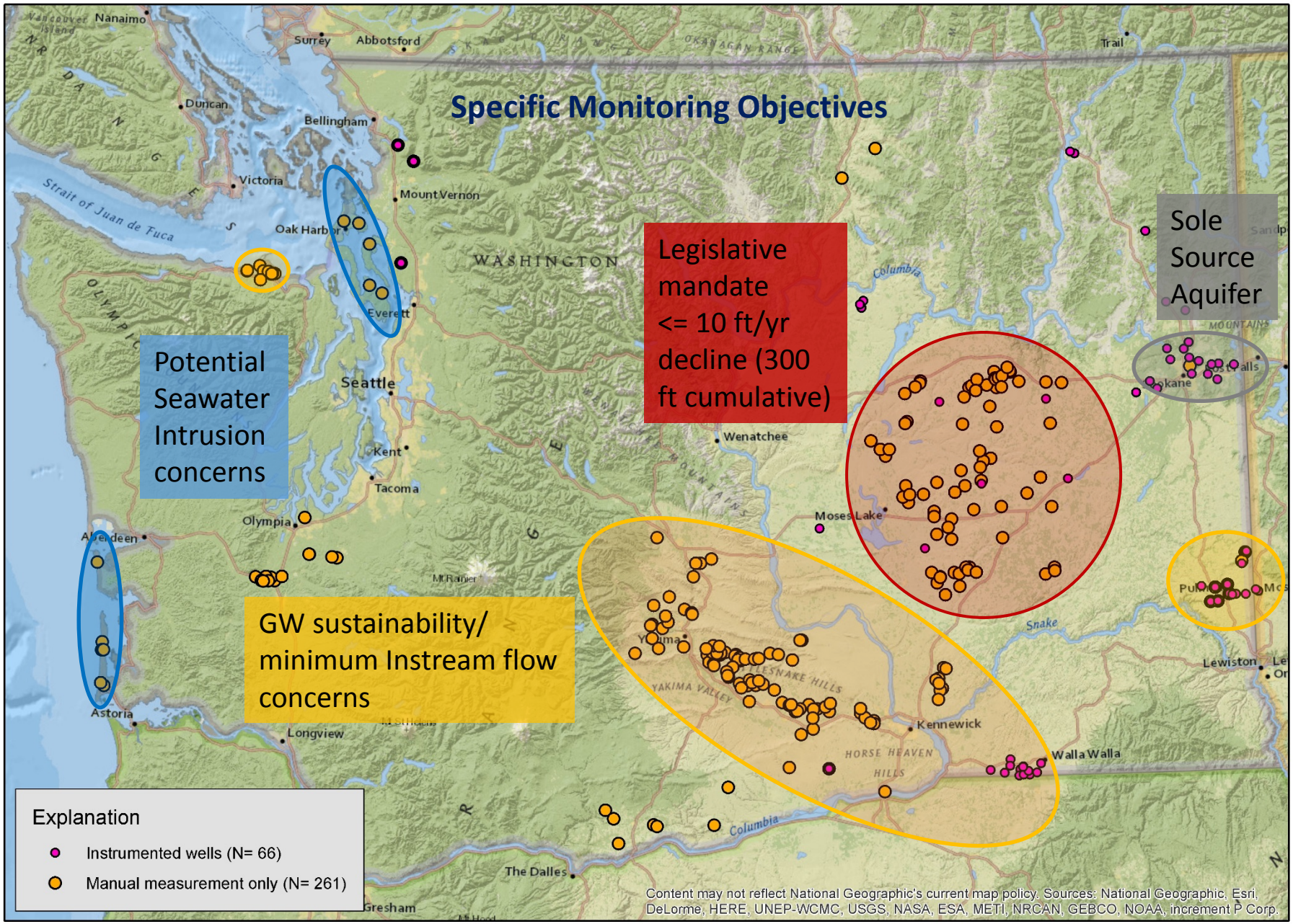
Study ID	CHPI001
Study Name	Moses Lake TMDL Groundwater Study
EIM Data Entry Review Status	Reviewed
Study Type	Total Maximum Daily Load (TMDL) development
Study Purpose	To investigate the nutrient content of the groundwater inflow to Moses Lake in support of the Moses Lake Phosphorus TMDL study
Field Collection Date Range	5/8/2001 - 10/3/2001
First/Last Loaded Date Range (First/Last updated)	date not available (3/26/2003) - date not available (5/24/2013)
Ecology Contact	Charles Pitz
Ecology Program or Other Responsible Entity	Ecy Environmental Assessment Program
Ecology Monitoring Program	
Submitting Organization	
Study QA Planning Level	LEVEL 4: Approved QAPP or SAP.
Study QA Project Plan Description	There is an approved Quality Assurance Project Plan QAPP available for review that describes the procedures used for this study.
Study QA Assessment Level	Level 5 - Data Verified and Assessed for Usability in a Peer-Reviewed Study Report
Study Result Description	
Study Comment	
Ecology Funding Number	
Ecology Facility/Site ID	
Ecology Cleanup Site ID	
Study ID Aliases (Alias Type)	
Study Security (User Name / Access Level)	CHPI461 / Update

▼ Study Publications

Quality Assurance Project Plan: Characterization of the Groundwater Discharge to Moses Lake, Washington

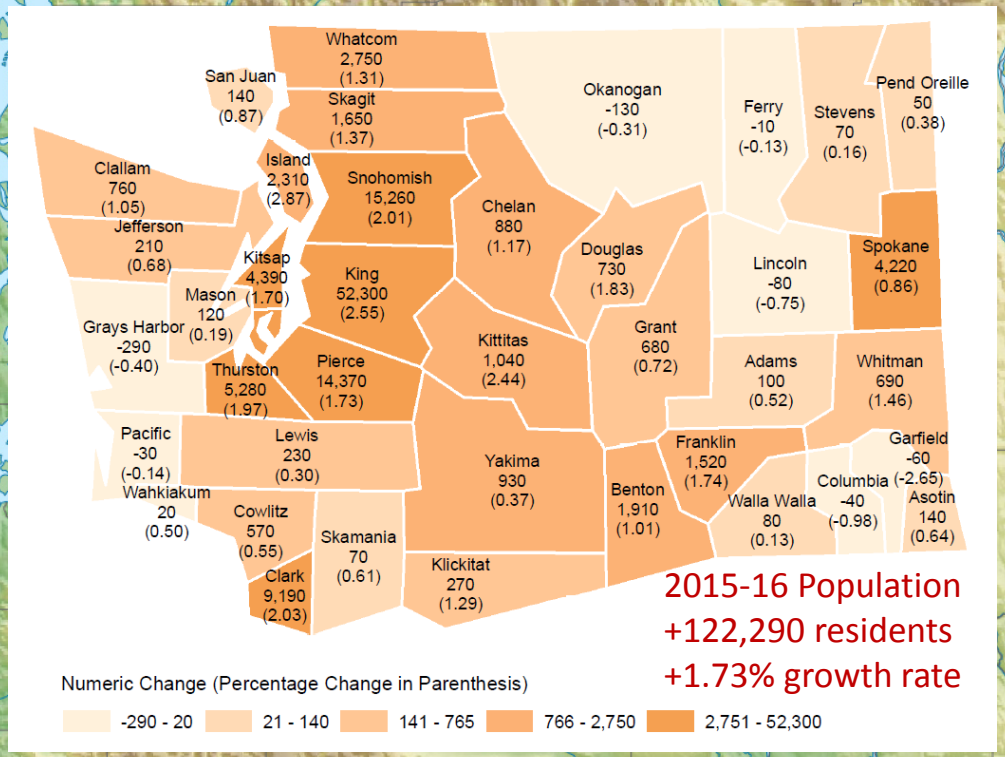
Moses Lake Total Maximum Daily Load Groundwater Study

Location of Wells Currently Monitored by Ecology as of April 2015



Additional Transboundary Water Management Challenges

GW nitrate contamination



2015-16 Population
+122,290 residents
+1.73% growth rate

Managing chronic GW level declines

Deep-well pumping interference

Aquifer storage and recovery/ instream flow maintenance

Recent Example of data use

Washington Groundwater Level Status and Trends - Spring 2016

A story map

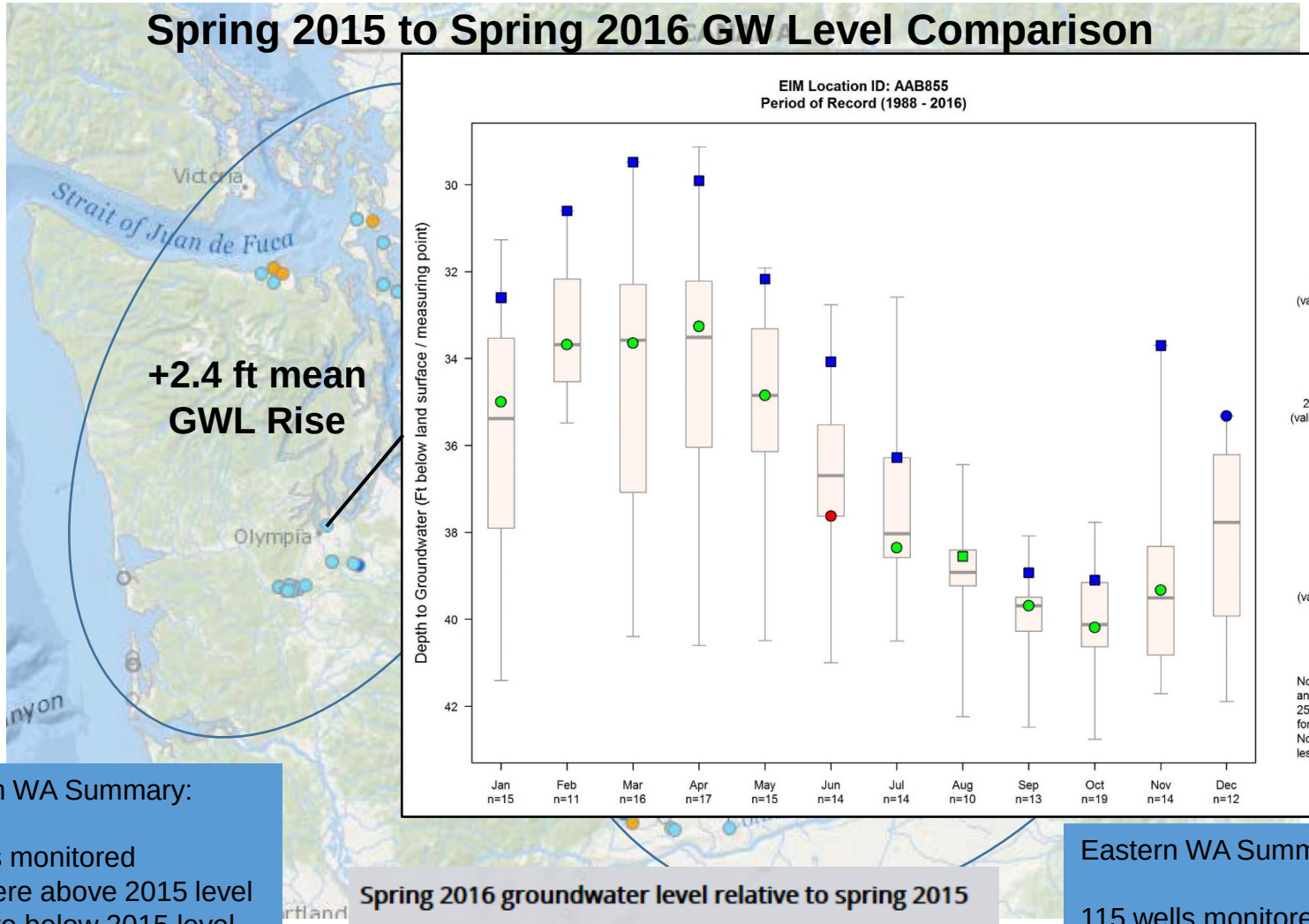
Introduction | 2015-16 Climate Summary | Spring 2016 Groundwater Level Status | Spring 2015 / 2016 Groundwater Level Comparison | WA Groundwater Level Trends | EDIT | ADD | ORGANIZE

Groundwater Monitoring and Management in Washington

The Washington State Department of Ecology (Ecology) has primary responsibility for managing Washington's water resources. In this role, Ecology conducts a variety of environmental monitoring activities to obtain the data and information needed to support agency water management decisions and long-term planning.

As part of this data collection effort, Ecology's Water Resources Program maintains groundwater level monitoring networks in each of the agency's four regions. Information from these networks are compiled annually by Ecology to assess both the status (i.e. current year conditions) and longer-term groundwater level/storage trends in State aquifers. This story map summarizes the results of the most recent evaluation which was conducted in Spring 2016.

Spring 2015 to Spring 2016 GW Level Comparison



Western WA Summary:

43 wells monitored
- 39 were above 2015 level
- 4 were below 2015 level

WL differences averaged +2.4 feet overall and ranged from -2.25 to +12.5 feet in individual wells

Spring 2016 groundwater level relative to spring 2015

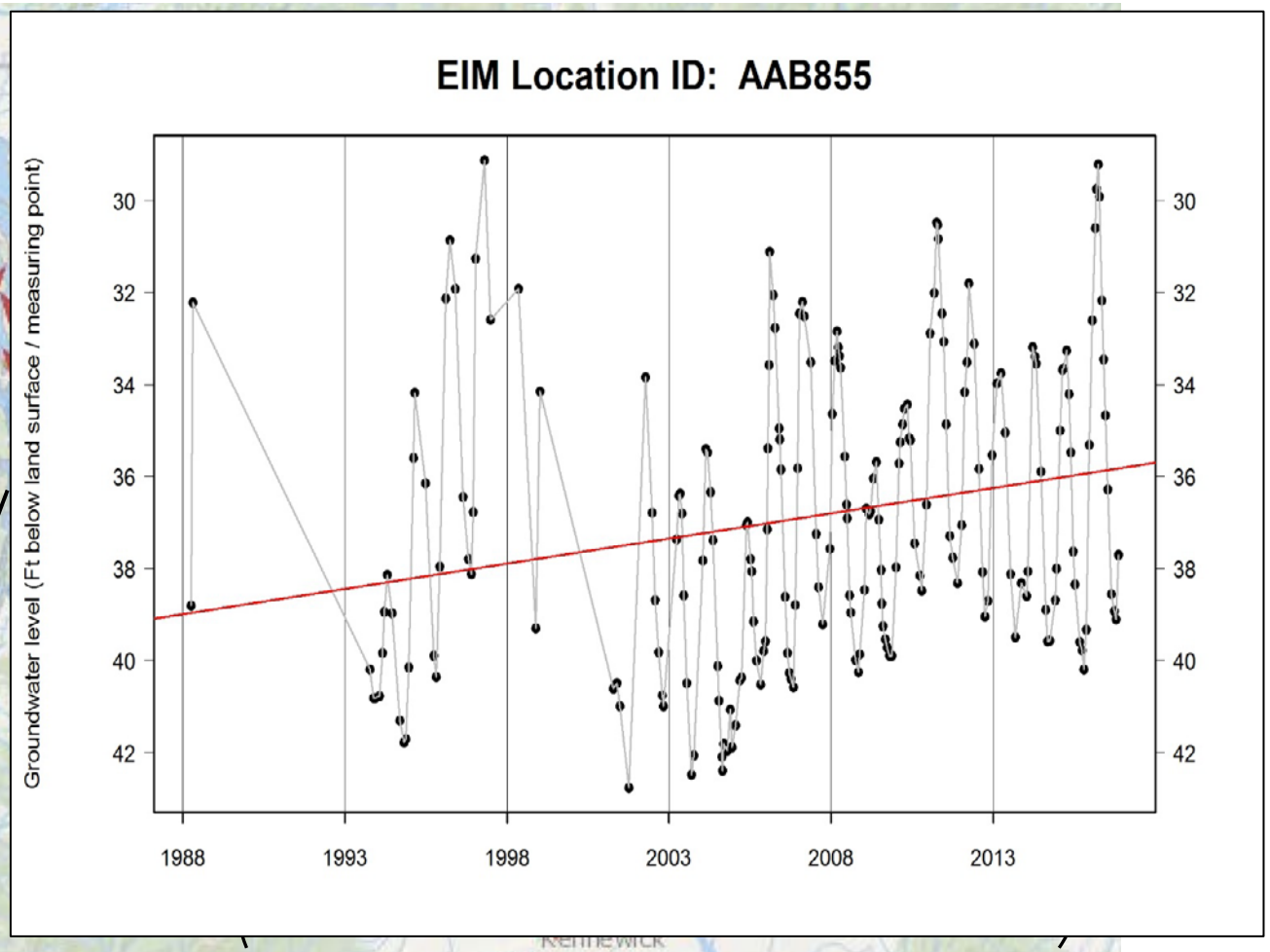
- Much above 2015 level (> +10 ft) N=9
- Above 2015 level (+0.01 to +9.99 ft) N=69
- Below 2015 level (-0.01 to -9.99 ft) N=60
- Much below 2015 level (> -10 ft) N=19
- Same as 2015 level (N=1)
- Missing 2015 measurement (N=54)

Eastern WA Summary:

115 wells monitored
- 39 were above 2015 level
- 75 were below 2015 level
- 1 same as 2015 level

WL differences averaged -1.43 feet overall and ranged from -28.4 to +58.9 feet in individual wells

Period of Record Groundwater Level Trends for Ecology Monitored Wells - Spring 2016

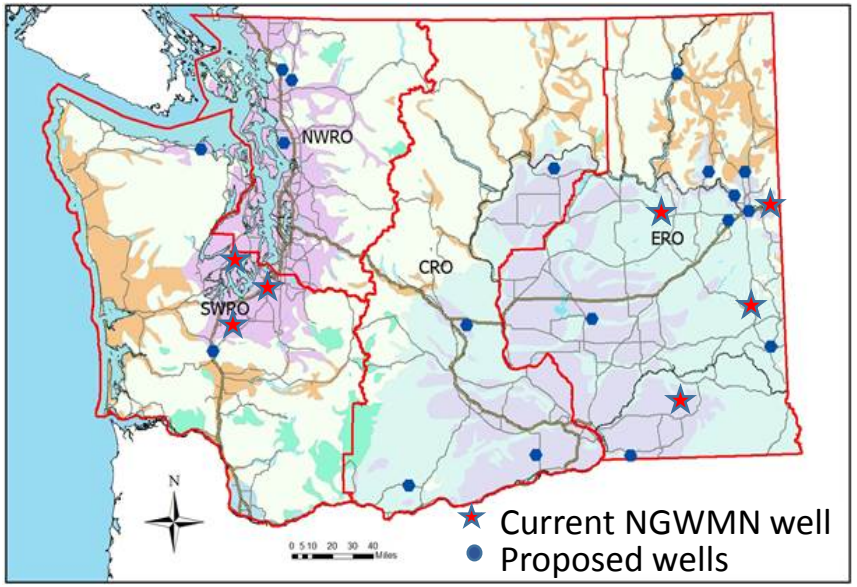


* Burns, E.R, Snyder, D.T, Haynes, J.V., and Waibel, M.S., 2012, Groundwater status and trends for the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho: U.S. Geological Survey Scientific Investigations Report 2012–5261, 52 p., http://pubs.er.usgs.gov/publication/sir20125261.

Planned Activities for Year 1 of Washington's NGWMN Grant (Oct 2016 - Sept 2017)

1) Begin Populating Well Registry (24 wells proposed by June 2017)

NGWMN element	EIM equivalent
Required data for all sites	
Name of Agency that collects data (R)	NA (Field collector at result level in EIM)
Site Number (R, C, WL, WQ, L) - Database key	Well Tag ID? or Location ID?
Site Name (R)	Location Name? or Location ID?
Country (R)	none
State (R)	State
County (R)	County
Latitude (decimal degrees) (R)	Latitude Decimal Degrees
Longitude (decimal degrees) (R)	Longitude Decimal Degrees
Horizontal Datum (R)	Horizontal Datum
Horizontal Location method (R)	Horizontal Coordinate Collection Method
Horizontal Location Accuracy (R)	Horizontal Coordinate Accuracy
National Aquifer Code (R)	none
Local Aquifer Code (R)	none
Type of site; Well/Spring (R)	Groundwater Location Type
Confinement Status; Confined/unconfined (R)	none
Lithology (L)	none
Lithology ID (L)	none
Description of Lithology of the unit (L)	none
Observation Method (L)	none
Beginning depth of lithologic unit (L)	none
Ending depth of lithologic unit (L)	none
Well Construction Information	
Land Surface Altitude (R)	Elevation of, and Elevation
Vertical Datum (R)	Elevation Datum
Well Depth (R)	Well Completion Depth
Well Depth Units (R)	Well Completion Depth Units
Top depth of Screen interval (C)	Well Open Interval Upper Depth
Bottom depth of Screen interval (C)	Well Open Interval Lower Depth
Depth of Screen interval unit of measure (C)	Well Open Interval Units
Screen interval material(C)	none
Top depth of Casing interval (C)	none
Bottom depth of Casing interval (C)	none
Depth of Casing interval unit of measure (C)	none
Casing interval material (C)	Well Casing Material
Required data for Water-level Sites	
Land surface altitude with Metadata (R)	Elevation of, and Elevation
Altitude Units (R)	Elevation Units
Altitude Accuracy (R)	Elevation Accuracy
Method of altitude measurement (R)	Elevation Collection Method
Date/Time/Time Zone of water-level measurement (WL)	Field collection start date / field collection start time / NA
Depth to Water (WL)	Result value
Water-level units (WL)	Result value units
Method of water-level measurement (WL)	Result method
Accuracy of water-level measurement (WL)	Water level accuracy
Required data for Water-Quality Sites	
o Date/Time/Time Zone of sample (WQ)	Field collection start date / field collection start time / NA
o Analyte Name (WQ)	Result Parameter Name
o Analyte value (WQ)	Result value
o Parameter unit (WQ)	Result value units
o Sample Fraction (WQ)	Fraction analyzed
o Chemical Identification Number (WQ)	Result parameter CAS number????
o Chemical Classification System (WQ)	Result parameter CAS number????
o Method (WQ)	Result method???
o Analytical Method System (WQ)	????



2) Develop web services to supply water levels to the NGWMN (June 2017)

Planned Activities for Grant Year 2 (Oct 2017 - Sep 2018):

NGWMN element	EIM equivalent
Required data for all sites	
Name of Agency that collects data (R)	NA (Field collector at result level in EIM)
Site Number (R, C, WL, WQ, L) - Database key	Well Tag ID? or Location ID?
Site Name (R)	Location Name? or Location ID?
Country (R)	none
State (R)	State
County (R)	County
Latitude (decimal degrees) (R)	Latitude Decimal Degrees
Longitude (decimal degrees) (R)	Longitude Decimal Degrees
Horizontal Datum (R)	Horizontal Datum
Horizontal Location method (R)	Horizontal Coordinate Collection Method
Horizontal Location Accuracy (R)	Horizontal Coordinate Accuracy
National Aquifer Code (R)	none
Local Aquifer Code (R)	none
Type of site; Well/Spring (R)	Groundwater Location Type
Confinement Status; Confined/unconfined (R)	none
Lithology (L)	none
Lithology ID (L)	none
Description of Lithology of the unit (L)	none
Observation Method (L)	none
Beginning depth of lithologic unit (L)	none
Ending depth of lithologic unit (L)	none
Well Construction Information	
Land Surface Altitude (R)	Elevation of, and Elevation
Vertical Datum (R)	Elevation Datum
Well Depth (R)	Well Completion Depth
Well Depth Units (R)	Well Completion Depth Units
Top depth of Screen interval (C)	Well Open Interval Upper Depth
Bottom depth of Screen interval (C)	Well Open Interval Lower Depth
Depth of Screen interval unit of measure (C)	Well Open Interval Units
Screen interval material(C)	none
Top depth of Casing interval (C)	none
Bottom depth of Casing interval (C)	none
Depth of Casing interval unit of measure (C)	none
Casing interval material (C)	Well Casing Material
Required data for Water-level Sites	
Land surface altitude with Metadata (R)	Elevation of, and Elevation
Altitude Units (R)	Elevation Units
Altitude Accuracy (R)	Elevation Accuracy
Method of altitude measurement (R)	Elevation Collection Method
Date/Time/Time Zone of water-level measurement (WL)	Field collection start date / field collection start time / NA
Depth to Water (WL)	Result value
Water-level units (WL)	Result value units
Method of water-level measurement (WL)	Result method
Accuracy of water-level measurement (WL)	Water level accuracy
Required data for Water-Quality Sites	
o Date/Time/Time Zone of sample (WQ)	Field collection start date / field collection start time / NA
o Analyte Name (WQ)	Result Parameter Name
o Analyte value (WQ)	Result value
o Parameter unit (WQ)	Result value units
o Sample Fraction (WQ)	Fraction analyzed
o Chemical Identification Number (WQ)	Result parameter CAS number????
o Chemical Classification System (WQ)	Result parameter CAS number????
o Method (WQ)	Result method???
o Analytical Method System (WQ)	????

- Provide continued support for water level web services/enhancements
- Develop web services for well construction and lithology data
- Continue ongoing work to migrate our backlog of transducer results to EIM and NGWNM
- Add additional wells to NGWMN as time and funding allow


Thank You!
DEPARTMENT OF
ECOLOGY
State of Washington