CHaMP Field Season 2014

Lots and lots and lots of data

- 22 Crews
- 124 Hitches
- 503 Surveys
- 393 files per survey
- 197,847 files validated and uploaded
Study Design

- Status and Trend
- Status and Trend and Effectiveness
- Status and Trend, Effectiveness and Multiple Populations
- Multiple Populations
- Other
- Columbia Basin Extent
Measurements are the ‘fine scale’ descriptions of the physical, chemical, hydrologic, geomorphic, biological characteristics of a stream, usually taken at a reach or habitat unit scale.
How Does CHaMP Measure Sticks and Stones?
Auxiliary Data Workflow

Logger Data Transferred Through Broker

Channel Units, Side Channels, Fish Cover, Ocular, Substrate, Pool Tail Fines, LWD, Pebbles, Embeddedness

Riparian, Discharge, Water Chemistry, Drift, Air Temperature, Stream Temperature

QA/QC
Sources of Crew Variability
We can control

- Protocol?
- Training?
- Protocol Implementation Drift?
- Equipment?
Data Quality

Clean, Repeatable, and Efficient Data Capture

Training

Field Protocol

Data Capture

Data Quality Checks
CHaMP Data Quality

Data Logger Application (quality control)
• Required values are non-null
• Numeric values are within range

Data Broker Application (quality control)
• Format and schema of files
• Completeness of all components

CHaMPMonitoring.org (quality assurance)
• Review number of records
• Review outliers (graphical)
• Sanity check (graphical)

CHaMPMonitoring.org (quality assurance)
• Review of derived metrics (graphical)

Knowledge Products

Many | Few | Many

Number of Products
CHaMPMonitoring.org

Quality Assurance Review

Site: dsgn4-000168 North Fork Catherine Creek

Stream Temperature

Display Series
- Within Site
  - Pass Data
  - Suspect Data
  - Reject Data
- Logger Dates
- Maintenance Dates
- Probe Messages
- Air Temperature

Nearby Sites
- CBV05583-109994
- CBV05583-138566
- CBV05583-253354
- CBV05583-513498
- CBV05583-313882
- dsgn4-000001

Offset Within Site
- One Year Offset
- Two Year Offset

Anomaly

Time Period
Start: 10/2/2011 12:00 AM
End: 10/13/2011 11:00 PM

Statistics
Count: 72
Min: 5.51°F
Mean: 11.07°F
Max: 23.28°F

Message
Hourly Variation greater than expected
Daily Mean Variation greater than expected
Daily Max Variation greater than expected
Daily Range greater than expected

Add Decision
CHaMP 2014
Data Quality Assurance Process

FIELD

- Data logger checks
- Total Station checks
- CHaMP Toolbar Topo checks

OFFICE: Champmonitoring.org and GIS

- Data upload to cm.org
- Measurement data review
  - aux
  - temperature
- Topo data review and repair
- Metric review and visit promotion
- Central cm.org QA review

OFFICE: Champmonitoring.org and GIS

- Metric Release

July

- Measurement data review
- Topo data review and repair

October

- Data upload to cm.org

November

- Metric review and visit promotion

December

- Central cm.org QA review

March 2015
Derivative Metrics from Topographic Surveys and Aux. Data

- DEMs
- Water Depth Maps
- D 50
- Large Wood Frequency
CHaMP Metric Assessment

Ensure CHaMP Metrics are Capable:

• Metric Capability is a Function of:
  • Measurement Accuracy and Precision (“Bias” and “Noise”)
  • Spatial and Temporal Variance Patterns
  • Sampling Design
  • Models from which Analyses, and Summary Products are Built

• Steps to Assessing Metric Capability:
  • Create Graphical Tools to Visualize Elements of Metric Capability
    • Patterns of Measurement Noise and Spatial/Temporal Variance
    • Identify Problems, Outliers, Data Transformation Needs, etc.
Variance Decomposition for Key CHaMP Metrics

Estimated Components of Variance, by Metric

- Variance component
- year
- watershed
- strata
- meas. noise
- site
RBT- Cross Sections from Topographic Data
RBT and GCD Measurements and Metrics

- Site Length (centerline)
- Site Length (Thalweg)
- Sinuosity
- Wetted width
- Bankfull width
- Bankfull Channel Capacity
- Area Sum
- RP100
- Pool tail crest depth average
- Pool max depth average
- Average Bankfull elevation
- Average channel capacity
- Average cross section area
- Average rectangular cross section area
- Site topographic gradient
- Site water surface gradient
- Site area wetted
- Site area bankfull
- Wetted volume
- Bankfull volume
- Detrended DEM standard deviation
- Water depth standard deviation

- For Each Channel Unit
  - Area
  - Volume
  - Count
  - Frequency
  - Spacing
  - Percent of site
  - Average Max Depth
  - Average Depth at Thalweg Exit
  - Average Residual Depth

- For Each Tier 1 and Tier 2 Channel Unit Type
  - Area
  - Volume
  - Count
  - Frequency
  - Spacing
  - Percent of site
  - Average Max Depth
  - Average Depth at Thalweg Exit
  - Average Residual Depth

- GCD results for the entire site, for each tier 1 and 2 channel unit type, and also for the common bankfull area between two visits:
  - Raw area of erosion
  - Thresholded area of erosion
  - Percent of area of interest with detectable change
  - Total net volume of difference
  - Total net volume of difference +/- error
  - Average net thickness of difference
  - Average net thickness of difference +/- error
  - Average net thickness of difference with detectable change
  - Average net thickness of difference with detectable change +/- error
Metrics Derived from Topographic Data Integrated with Auxiliary Data

Channel Unit Attributes

Pool
Riffle
Non-Turb
Riffle

Depth (m)

Velocity (m/s)
# CHaMP Metric Annual QA

<table>
<thead>
<tr>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
</tr>
</thead>
</table>
| Metric development and testing | Final list of proposed RBT and Aux metrics | - RBT metric  
- programming complete | RBT metric validation | Metric metadata development for mm.org, cm.org | Metric data dictionary Review for C.M | Metrics available on cm.org | Watershed and central metric QA complete | CHaMP Metric QA complete | Metrics released to public | On time! |
<table>
<thead>
<tr>
<th>Watersheds</th>
<th>Sites sampled</th>
<th>Data uploaded</th>
<th>Topo To Do</th>
<th>Topo unknown</th>
<th>Topo special cases</th>
<th>Temp data QA</th>
<th>Metrics promoted</th>
<th>Metrics released</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asotin</td>
<td>20</td>
<td>20</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Entiat</td>
<td>75</td>
<td>75</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grande Ronde</td>
<td>75</td>
<td>75</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>John Day</td>
<td>95</td>
<td>30</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lemhi</td>
<td>43</td>
<td>43</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methow</td>
<td>26</td>
<td>26</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Minam</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Na</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>South Fork Salmon</td>
<td>25</td>
<td>25</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tucannon</td>
<td>33</td>
<td>33</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>N</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wenatchee</td>
<td>33</td>
<td>33</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Yankee Fork</td>
<td>25</td>
<td>25</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>Na</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Big Creek (CA)</td>
<td>25</td>
<td>14</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Umatilla</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Deschutes, Walla Walla</td>
<td>14</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>Na</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
APPLICATION PRODUCTS

are the outputs of a specific model, tool or software application, and are produced using combinations of different metrics. Examples of application products include hydraulic models, habitat models, bio-energetic models, geomorphic change detection, etc.
Habitat Suitability Index

Input Data
- Morphology/Hydraulics
  - Water depth
  - Flow velocity
  - Substrate

HSC
- Preference Functions

HSI
- Habitat Suitability

Product
Minimum

Arithmetic Mean
Geometric Mean

*can weight individual variables

http://www.casimir-software.de/data/CASiMiR_Fish_Handb_EN_pdf
## CHaMP HSI Data Inputs

<table>
<thead>
<tr>
<th>Habitat Variable</th>
<th>Spatial Resolution</th>
<th>Spatial Data Source</th>
<th>Primary CHaMP Survey Data</th>
<th>Life Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velocity, Depth</td>
<td>10-cm cell</td>
<td>Delft3D hydraulic model</td>
<td>Topographic data, substrate/roughness, flow data</td>
<td>All</td>
</tr>
<tr>
<td>Substrate</td>
<td>Channel Unit</td>
<td>Derived</td>
<td>Areal % substrate categories</td>
<td>Spawner-Embryo</td>
</tr>
<tr>
<td>Cover</td>
<td>Channel Unit</td>
<td>Derived</td>
<td>Cover, Undercut Banks, Areal % Substrate</td>
<td>Juvenile Rearing</td>
</tr>
<tr>
<td>Water Temperature</td>
<td>Site</td>
<td>Derived</td>
<td>Mean, Min., Max at daily, 8-day, or monthly scales</td>
<td>All</td>
</tr>
<tr>
<td>Fines</td>
<td>Channel Unit</td>
<td>Derived</td>
<td>Areal % substrate, pebble counts</td>
<td>Spawner - Embryo</td>
</tr>
</tbody>
</table>
Receive Input Data (CHaMP)

DEM, WSE-DEM, Thalweg, Particle Size Distribution (D84), Discharge
Geomorphologic Change Detection

Vertical Change (m)

Wetted Centerline

2013, Tucannon, CBW05583-519039
Carrying Capacity
YOU ARE THE FOUNDATIONAL BRICKS!

Number of Products

Many

Few

Many

YOU ARE THE FOUNDATIONAL BRICKS!