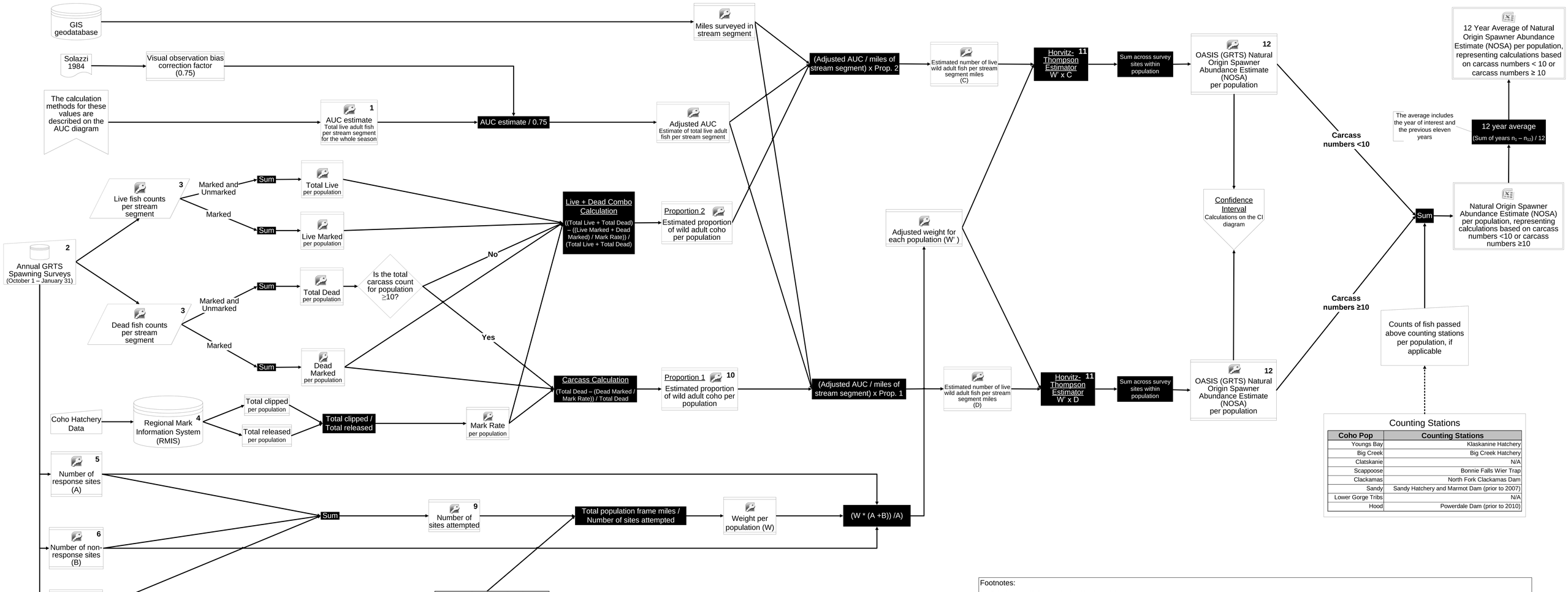
Lower Columbia coho – Natural Origin Spawner Abundance (NOSA) – Oregon Adult Salmonid Inventory and Sampling Program (OASIS), ODFW – Spawning Years 2002-present

This is a continuous long-term effort. This diagram was last completed for the most recent spawning year but should apply to following years unless changes are made to study design or calculations.



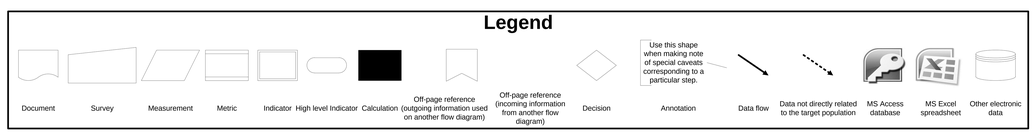
Total Population Frame Miles

Coho Population	Frame Miles[8]
Youngs Bay	64.48
Big Creek	43.58
Clatskanie River	60.05
Scappoose Creek	75.73
Clackamas River	248.83
Sandy River	110.38
Lower Gorge Tribs	5.61
Hood River	4.9

Counting Stations

Coho Pop	Counting Stations
Youngs Bay	Klaskanine Hatchery
Big Creek	Big Creek Hatchery
Clatskanie	N/A
Scappoose	Bonnie Falls Wier Trap
Clackamas	North Fork Clackamas Dam
Sandy	Sandy Hatchery and Marmot Dam (prior to 2007)
Lower Gorge Tribs	N/A
Hood	Powerdale Dam (prior to 2010)

Legend



Creator: Nadine Craft, Jake Chambers
Date: 09/02/2014, revised on 02/24/2015
File name: RecoveryTracker.mdb
Notes: Matt Weeber approved original diagram for use on 10/21/2011. Julie Firman approved edits on 09/02/14. Jacks are included in these estimates.

Footnotes:

1. Calculated in MS Access via visual basic module.
2. Generalized Random Tessellation Stratified (GRTS) survey. Data is collected in the field via PDA and stored in Pendragon for the field season. For illustration purposes this diagram shows the calculations for a single survey site within a population. In practice, the calculations shown are performed for each site through the Horvitz-Thompson (HT) estimator. The results of the HT estimator process are summed for all sites within the population to achieve a population estimate below known counting stations.
3. Marked, unmarked, and unknown.
4. http://www.rmpc.org/
5. Those sites classified as "surveyed." Meaning an AUC estimate was generated and no survey gap rules were violated (i.e. no survey gaps ≥16 days apart and no greater than one gap 12 -15 days apart).
6. Those sites which were "denied" access, or "inaccessible" due to time constraints/survey danger, or "dropped" due to survey complications, or "No AUC"ed due to lack of surveys/gaps in survey rotation.
7. Those sites deemed "zero" spawning habitat either because they are above a barrier or lack suitable spawning gravel.
8. The number of miles the final estimate can be expanded to (i.e. the scope of inference). It is an estimated number based on professional opinion, plus what OASIS has verified on the ground; the original numbers came from StreamNet.
9. This number can vary depending on budgets and crew availability.
10. Carcasses only.
11. Internal calculations using R Code statistical software. See the appendices 1-4 in Stevens 2002 for details and examples. Also see Jacobs et. al. 2002 and Lewis et. al. 2009 for modifications of the original method due to sampling and logistical constraints. Weblink for R script: http://cran.r-project.org/web/packages/spsurvey/index.html
12. Natural spawner abundance per population below known counting stations done by OASIS (i.e. the estimated number of natural origin spawners per population given the estimated number of frame miles). The final numbers reported to the Oregon Production Index Technical Team (OPITT) includes the GRTS estimate (OASIS Natural Spawner Abundance Estimate described above) plus dam counts and hatchery data for un-sampled areas above counting stations where wild fish are passed.

References:

Beidler, W.M., and T.E. Nickelson. 1980. An evaluation of the Oregon Department of Fish and Wildlife standard spawning survey system for coho salmon. Oregon Department of Fish and Wildlife, Information Reports (Fish) 80-9, Salem, Oregon.

Diaz-Ramos, S., D.L. Stevens, and A.R. Olsen 1996. EMAP Statistical Methods Manual. Environmental Monitoring and Assessment Program, Corvallis, Oregon.

Horvitz, D.G. and D.J. Thompson. 1952. 'A generalization of sampling without replacement from a finite universe'. *Journal of the American Statistical Association* **47**, 663-685.

Jacobs S., J. Firman, G. Susac, D. Steward and J. Weybright. 2002. Status of Oregon coastal stocks of anadromous salmonids, 2000-2001 and 2001-2002; Monitoring Program Report Number OPSW-ODFW-2002-3, Oregon Department of Fish and Wildlife, Portland, Oregon.

Lewis, M., E. Brown, B. Sounhein, M. Weeber, E. Suring, and H. Truemper. 2009. Status of Oregon stocks of coho salmon, 2004-2008. Monitoring Program Report Number OPSW-ODFW-2009-3, Oregon Department of Fish and Wildlife, Salem, Oregon.

ODFW. 2010. Salmon spawning survey procedures manual 2010. Oregon adult salmonid inventory and sampling (OASIS) Project. Oregon Department of Fish and Wildlife, Corvallis, Oregon. http://oregonstate.edu/dept/ODFW/spawn/pdf%20files/reports/2010_SSManual.pdf

Perrin, C. J., and J. R. Irvine. 1990. A Review of Survey Life Estimates as They Apply to the Area-Under-the-Curve Method for Estimating the Spawning Escapement of Pacific Salmon. Canadian Technical Report of Fisheries and Aquatic Sciences (1733):49.

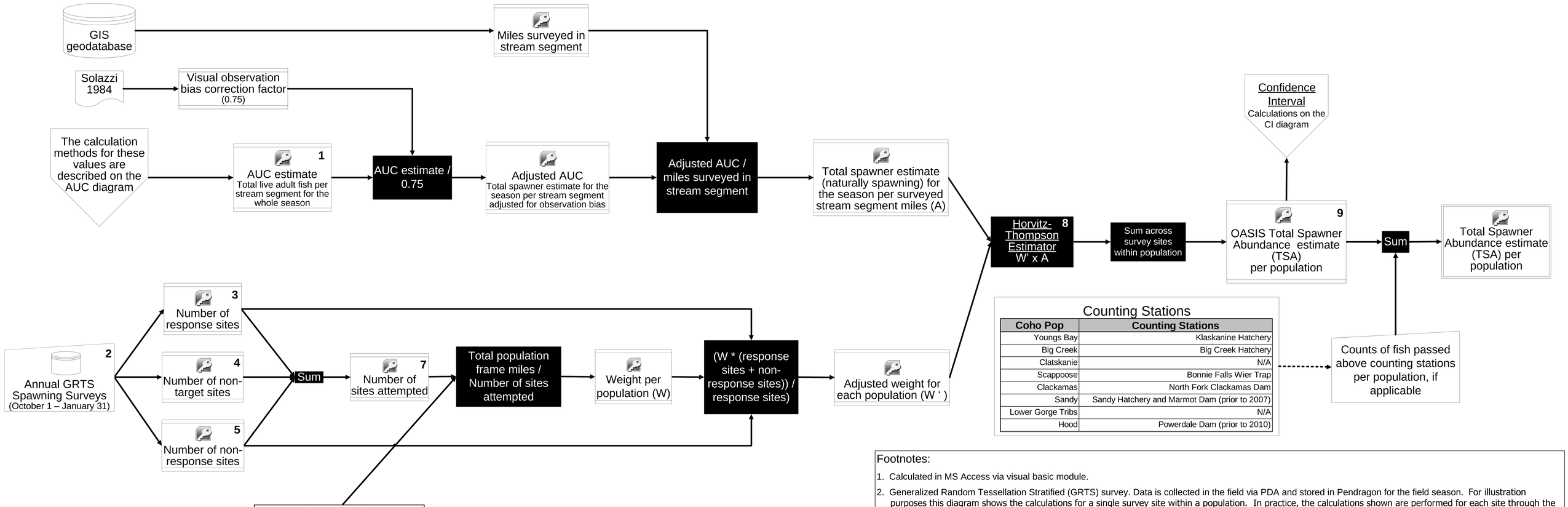
Solazzi, M.F. 1984. Relationship between visual counts of coho, chinook and chum salmon from spawning fish surveys and the actual number of fish present. Oregon Department of Fish and Wildlife, Information Reports (Fish) 84-7, Portland.

Stevens, D.L. 2002. Sampling design and statistical analysis methods for integrated biological and physical monitoring of Oregon streams. OPSW-ODFW-2002-07, Oregon Department of Fish and Wildlife, Salem, Oregon.

Willis, R.A. 1954. The length of time that silver salmon spent before death on spawning grounds at Spring Creek, Wilson River in 1951-52. Fish Commission of Oregon Research Briefs 5:27-31.

Lower Columbia coho – Total Spawner Abundance (TSA) – Oregon Adult Salmonid Inventory and Sampling Program (OASIS), ODFW – Spawning Years 2002-present

This is a continuous long-term effort. This diagram was last completed for the most recent spawning year but should apply to following years unless changes are made to study design or calculations.



Counting Stations

Coho Pop	Counting Stations
Youngs Bay	Klaskanine Hatchery
Big Creek	Big Creek Hatchery
Clatskanie	N/A
Scappoose	Bonnie Falls Wier Trap
Clackamas	North Fork Clackamas Dam
Sandy	Sandy Hatchery and Marmot Dam (prior to 2007)
Lower Gorge Tribs	N/A
Hood	Powerdale Dam (prior to 2010)

Total Population Frame Miles

Coho Population	Frame Miles[6]
Youngs Bay	64.48
Big Creek	43.58
Clatskanie River	60.05
Scappoose Creek	75.73
Clackamas River	248.83
Sandy River	110.38
Lower Gorge Tribs	5.61
Hood River	4.9

Footnotes:

1. Calculated in MS Access via visual basic module.
2. Generalized Random Tessellation Stratified (GRTS) survey. Data is collected in the field via PDA and stored in Pendragon for the field season. For illustration purposes this diagram shows the calculations for a single survey site within a population. In practice, the calculations shown are performed for each site through the Horvitz-Thompson (HT) estimator. The results of the HT estimator process are summed for all sites within the population to achieve a population estimate below known counting stations.
3. Those sites classified as "surveyed." Meaning an AUC estimate was generated and no survey gap rules were violated (i.e. no survey gaps ≥16 days apart and no greater than one gap 12 -15 days apart).
4. Those sites which were "denied" access, or "inaccessible" due to time constraints/survey danger, or "dropped" due to survey complications, or "No AUC"ed due to lack of surveys/gaps in survey rotation.
5. Those sites deemed "zero" spawning habitat either because they are above a barrier or lack suitable spawning gravel.
6. The number of miles the final estimate can be expanded to (i.e. the scope of inference). It is an estimated number based on professional opinion, plus what OASIS has verified on the ground; the original numbers came from StreamNet.
7. This number can vary depending on budgets and crew availability.
8. Internal calculations using R Code statistical software. See the appendices 1-4 in Stevens 2002 for details and examples. Also see Jacobs et. al. 2002 and Lewis et. al. 2009 for modifications of the original method due to sampling and logistical constraints. Weblink for R script: http://cran.r-project.org/web/packages/spsurvey/index.html
9. Total spawner abundance per population below known counting stations done by OASIS (i.e. the estimated total number of spawners per population given the estimated number of frame miles).

References:

Beidler, W.M., and T.E. Nickelson. 1980. An evaluation of the Oregon Department of Fish and Wildlife standard spawning survey system for coho salmon. Oregon Department of Fish and Wildlife, Information Reports (Fish) 80-9, Salem, Oregon.

Diaz-Ramos, S., D.L. Stevens, and A.R. Olsen 1996. EMAP Statistical Methods Manual. Environmental Monitoring and Assessment Program, Corvallis, Oregon.

Horvitz, D.G. and D.J. Thompson. 1952. 'A generalization of sampling without replacement from a finite universe'. *Journal of the American Statistical Association* **47**, 663-685.

Jacobs S., J. Firman, G. Susac, D. Steward and J. Weybright. 2002. Status of Oregon coastal stocks of anadromous salmonids, 2000-2001 and 2001-2002; Monitoring Program Report Number OPSW-ODFW-2002-3, Oregon Department of Fish and Wildlife, Portland, Oregon.

Lewis, M., E. Brown, B. Sounhein, M. Weeber, E. Suring, and H. Truemper. 2009. Status of Oregon stocks of coho salmon, 2004-2008. Monitoring Program Report Number OPSW-ODFW-2009-3, Oregon Department of Fish and Wildlife, Salem, Oregon.

ODFW. 2010. Salmon spawning survey procedures manual 2010. Oregon adult salmonid inventory and sampling (OASIS) Project. Oregon Department of Fish and Wildlife, Corvallis, Oregon. http://oregonstate.edu/dept/ODFW/spawn/pdf%20files/reports/2010_SSManual.pdf

Perrin, C. J., and J. R. Irvine. 1990. A Review of Survey Life Estimates as They Apply to the Area-Under-the-Curve Method for Estimating the Spawning Escapement of Pacific Salmon. Canadian Technical Report of Fisheries and Aquatic Sciences (1733):49.

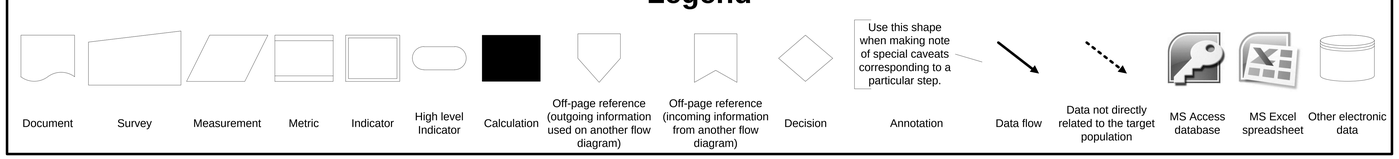
Solazzi, M.F. 1984. Relationship between visual counts of coho, chinook and chum salmon from spawning fish surveys and the actual number of fish present. Oregon Department of Fish and Wildlife, Information Reports (Fish) 84-7, Portland.

Stevens, D.L. 2002. Sampling design and statistical analysis methods for integrated biological and physical monitoring of Oregon streams. OPSW-ODFW-2002-07, Oregon Department of Fish and Wildlife, Salem, Oregon.

Willis, R.A. 1954. The length of time that silver salmon spent before death on spawning grounds at Spring Creek, Wilson River in 1951-52. Fish Commission of Oregon Research Briefs 5:27-31.

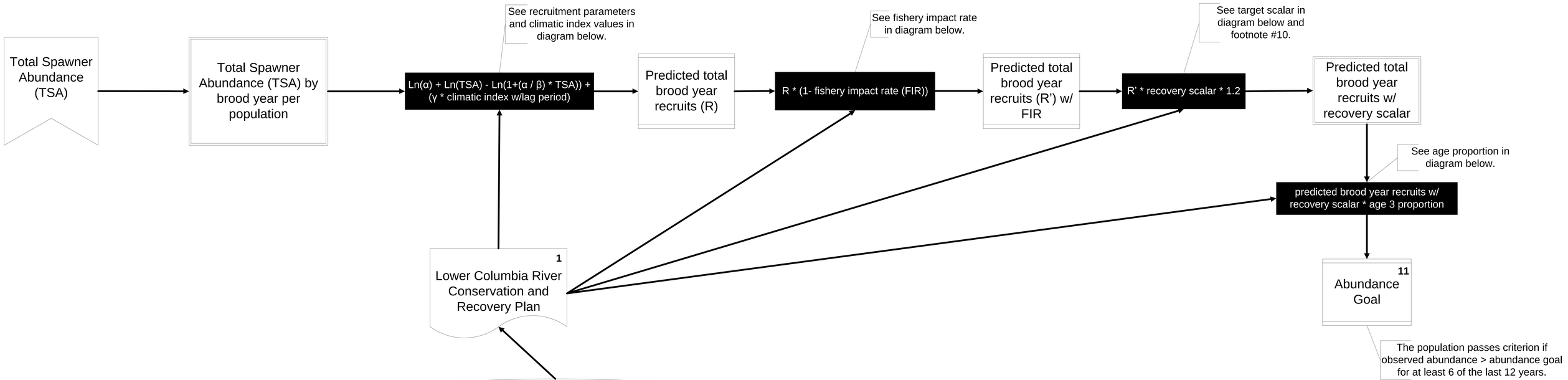
Creator:	Erik Archer, Beth Timmons, Stephanie Archer, Nadine Craft
Date:	10/11/2011, revised on 09/02/2014
File name:	RecoveryTracker.mdb
Notes:	DRAFT - Matt Weeber approved original diagram for use on 10/21/11.
Julie Firman approved edits on 09/02/14.	

Legend



Lower Columbia coho – Abundance Goal – Oregon Adult Salmonid Inventory and Sampling Program (OASIS), ODFW – Spawning Years 2002-present

This is a continuous long-term effort. This diagram was last completed for the most recent spawning year, but should apply to following years unless changes are made to study design or calculations.



Recruitment Parameters

Population	Estimation Method[2]	Alpha (α)	Beta (β)	Gamma (γ)	Climate Index[3]	Time Lag[4]
Youngs	Inference	0.68	3717	1.54	CLRSI	-2
Big	Inference	0.68	2166	1.54	CLRSI	-2
Clatskanie	Inference	9.37	3356	1.54	CLRSI	-2
Scappoose	Inference	12.48	4433	1.54	CLRSI	-2
Clackamas	Data	6.2	18433	1.62	CLRSI	-2
Sandy	Data	7.25	6720	1.47	CLRSI	-1
Lower Gorge	Inference	0.85	885	1.54	CLRSI	-2
Upper Gorge/Hood	Inference	0.85	1769	1.54	CLRSI	-2

Definitions for recruitment parameters:
Alpha – for each population the value estimated for the alpha parameter describes how rapidly the population can rebound from a low abundance level.
Beta – the beta parameter represents the asymptotic upper limit for the number of fish that the habitat can produce (theoretical capacity).
Gamma – the gamma parameter controls how the recruitment process responds to annual differences in the environmental variable.

Example Values of Climatic Index

Year	Period	Lag	Climatic Index[3]	Value[5]
2012	7	-1	CLRSI	-0.016
2013	7	-1	CLRSI	-0.240
2014	7	-1	CLRSI	-0.308
2012	7	-2	CLRSI	-0.488
2013	7	-2	CLRSI	-0.643
2014	7	-2	CLRSI	-0.627

Fishery Impact Rates (FIR)[6]

Population	Current Harvest	Delisting Scenario
Youngs	0.9	0.9
Big	0.7	0.7
Clatskanie	0.35	0.25
Scappoose	0.35	0.25
Clackamas	0.35	0.25
Sandy	0.35	0.25
Lower Gorge	0.35	0.25
Upper Gorge/Hood	0.35	0.05

Age Composition[7]

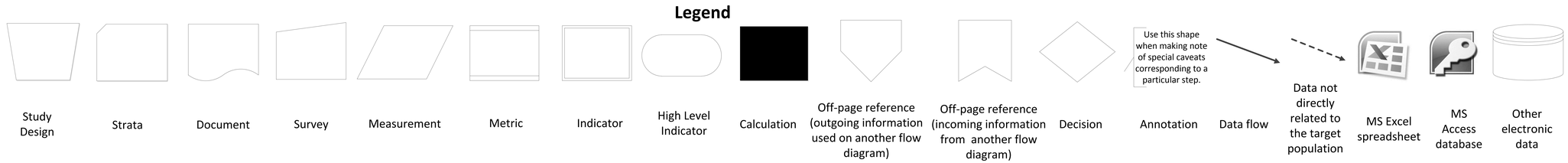
Population	Age	Proportion
Clackamas	2	0
Clackamas	3	1
Sandy	2	0
Sandy	3	1

Recovery Scalar

Population	Target Risk[8]	Target Scalar[9]
Youngs	VH	1
Big	VH	1
Clatskanie	VL	1.7
Scappoose	VL	1.28
Clackamas	VL	1.2
Sandy	L	1.95
Lower Gorge	H	3.5
Upper Gorge/Hood	L	6.2

Footnotes:
1. http://www.dfw.state.or.us/fish/CRP/lower_columbia_plan.asp
2. Populations for which data were used to estimate recruitment model parameters are denoted in this column as "Data" and those for which the parameters were determined indirectly are denoted "Inference".
3. CLRSI = Crater Lake and Rainer Snow Index, CRF = Columbia River Flow, nSPDO = Negative Spring Pacific Decadal Oscillation Index.
4. Number of years the midpoint of the environmental index was lagged relative to the parental brood year that best fit the data or was inferred to provide this fit.
5. Example values of climatic index for brood years 2012-2014. Values change from year to year.
6. Assumed fishery impact rates (FIR) for 'current conditions' extinction risk modeling for lower Columbia River populations of coho.
7. A variable number of age 2 jacks are observed in most years, however they are not consistently counted. Since 2 year old coho are thought to be a minor contribution to the reproductive characteristics of coho populations, no attempt was made to quantify their abundance.
8. H = high extinction risk, M = moderate extinction risk, L = low extinction risk, VH = very high extinction risk, VL = very low extinction risk.
9. The recovery scalar is the amount that the current survival rate needs to be improved to get the probability of critical risk threshold (CRT) to the threshold for the risk category targeted for the population.
10. 1.2 = 20% expansion to buffer the impacts of climate change.
11. Only age 3 adults are calculated for coho.

Legend

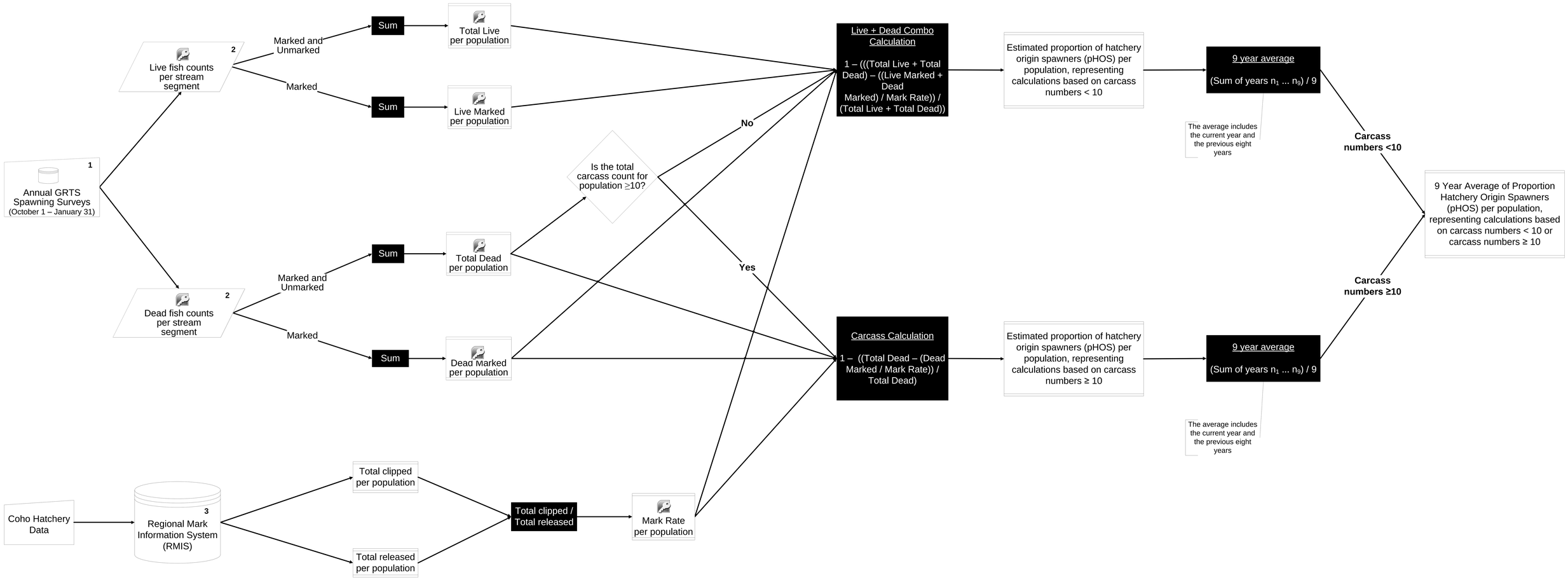


Created By:	Chambers, J. (NRIMP - ODFW)
Date:	20150420
File Name:	RecoveryTracker.mdb
Population Name:	Lower Columbia coho
Notes (Annotations, general comments, references, etc.):	Direct flow of calculations for Abundance Goal is derived from the database that is used to formulate abundance and productivity indicators for NOAA. For more information on the DAFD or to obtain the dataset, contact Oregon Plan Research Analyst Julie Firman - julie.firman@oregonstate.edu.

Disclaimer: Care was taken in the creation of these themes, but they are provided "as is". The Oregon Department of Fish and Wildlife cannot accept any responsibility for errors, omissions, or positional accuracy in the digital data or underlying records. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying any of these products.

Lower Columbia coho – Proportion Hatchery Origin Spawners (pHOS) – Oregon Adult Salmonid Inventory and Sampling Program (OASIS), ODFW – Spawning Years 2002-present

This is a continuous long-term effort. This diagram was last completed for the most recent spawning year but should apply to following years unless changes are made to study design or calculations.

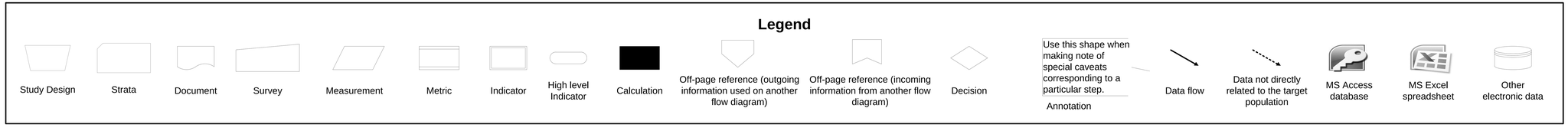


Footnotes:

1. Generalized Random Tessellation Stratified (GRTS) survey. Data is collected in the field via PDA and stored in Pendragon for the field season.
2. Marked, unmarked, and unknown.
3. http://www.rmpc.org/

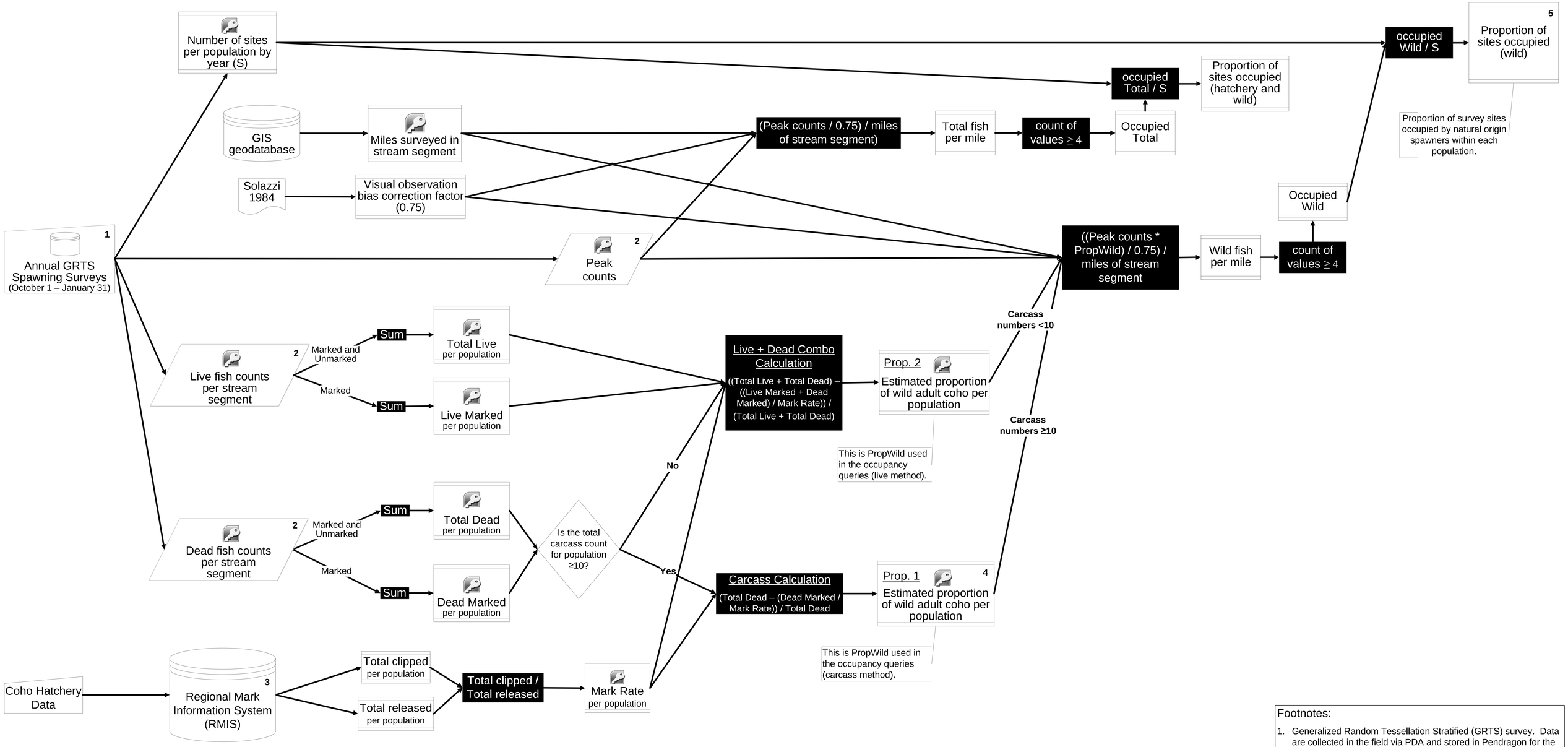
Created By:	Chambers, J. (NRIMP - ODFW)
Date:	20150219
File Name:	RecoveryTracker.mdb
Population Name:	Lower Columbia coho
Notes (Annotations, general comments, references, etc.):	Direct flow of calculations for Proportion Hatchery Origin Spawners is derived from the database that is used to formulate abundance and productivity indicators for NOAA. For more information on the DAFD or to obtain the dataset, contact Oregon Plan Research Analyst Julie Firman - julie.firman@oregonstate.edu.
	Disclaimer: Care was taken in the creation of these themes, but they are provided "as is". The Oregon Department of Fish and Wildlife cannot accept any responsibility for errors, omissions, or positional accuracy in the digital data or underlying records. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying any of these products.

Legend

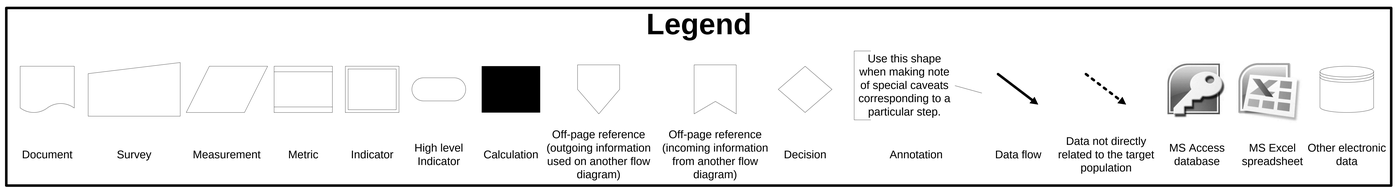


Lower Columbia coho – Percent Occupancy – Oregon Adult Salmonid Inventory and Sampling Program (OASIS), ODFW – Spawning Years 2002-present

This is a continuous long-term effort. This diagram was last completed for the most recent spawning year but should apply to following years unless changes are made to study design or calculations.



Legend

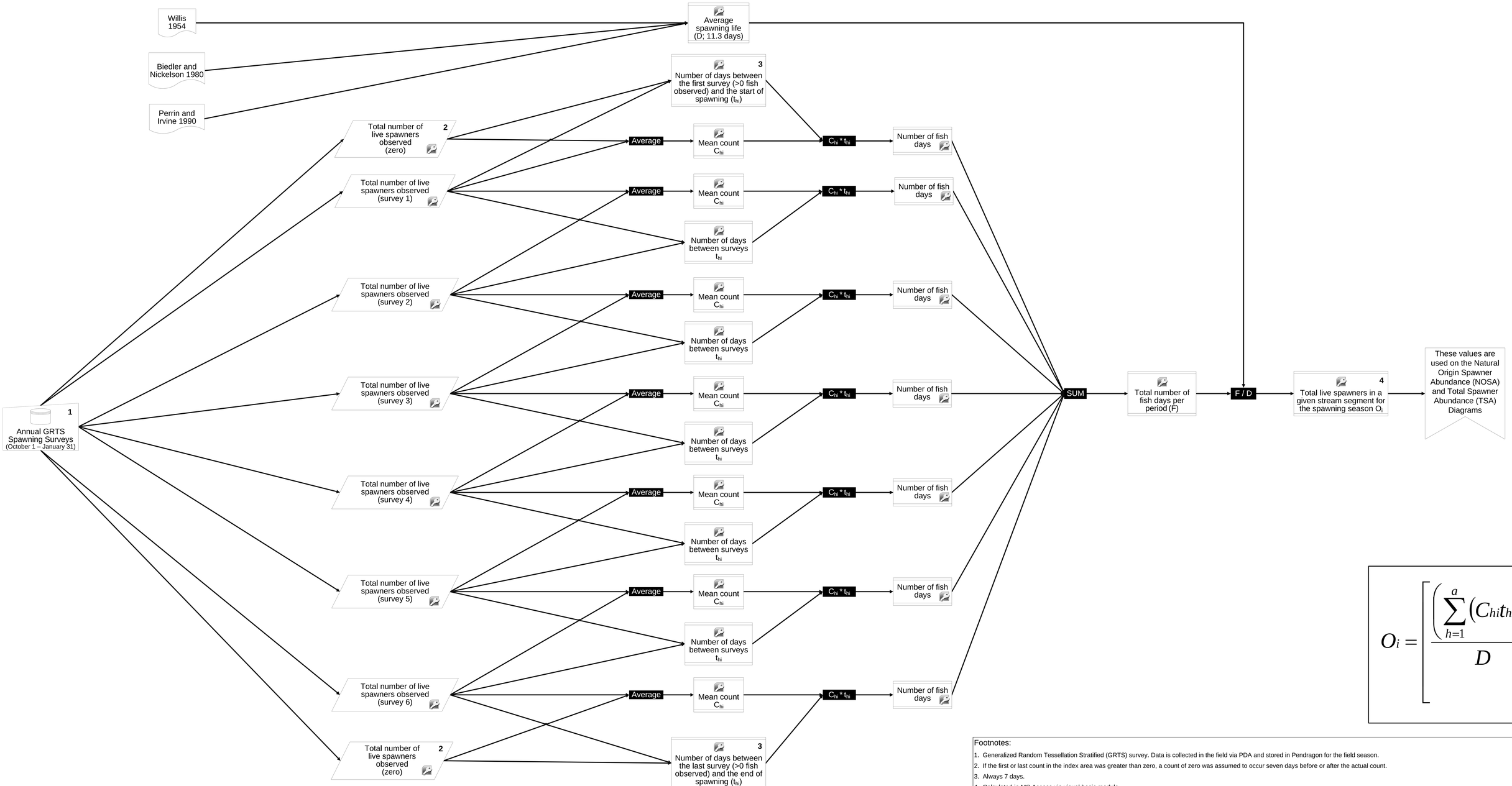


Footnotes:

1. Generalized Random Tessellation Stratified (GRTS) survey. Data are collected in the field via PDA and stored in Pendragon for the field season. The calculations shown are performed for each site through the Horvitz-Thompson (HT) estimator.
2. Marked, unmarked, and unknown.
3. http://www.rmpc.org/
4. Carcasses only.
5. Proportion of sites Occupied (wild) is reported as percent occupancy in the Recovery Tracker and is defined as the proportion of successfully surveyed sites that meet the occupancy threshold. $\%Occ = Sites_{Occ}/Sites_{Total} * 100$
   Where: $Sites_{Occ}$ = Number of successfully-surveyed sites that meet the occupancy threshold and $Sites_{Total}$ = Total number of successfully surveyed sites.

Creator:	Erik Archer, edited JLC
Date:	12/2/2011, 4/20/2015
File name:	RecoveryTracker.mdb
Notes:	Matt Weeber approved original diagram for use. Julie Firman approved the updates and addition of live counts and carcass decision. Jacks are not included in these estimates.

Oregon Adult Salmonid Inventory and Sampling Program (OASIS) – Area-Under-The-Curve Spawner Estimate Methods – ODFW



5

$$O_i = \left[\frac{\left(\sum_{h=1}^{a} \left(C_{hi} t_{hi} \right) \right)}{D} \right]$$

Footnotes:

1. Generalized Random Tessellation Stratified (GRTS) survey. Data is collected in the field via PDA and stored in Pendragon for the field season.
2. If the first or last count in the index area was greater than zero, a count of zero was assumed to occur seven days before or after the actual count.
3. Always 7 days.
4. Calculated in MS Access via visual basic module.
5. a = number of periods; C_{hi} = mean count in period h; t_{hi} = number of days in period h; D = average spawning life (days) of salmon in survey segments. Survey data were screened to avoid making spawning density estimates for stream segments where few data points were available or significant portions of the run were missed. These qualification criteria pertained to: 1) the duration of the spawning season over which counts needed to be made; 2) the number of counts that needed to be conducted for each survey; and 3) the number of times that the interval between successive counts could exceed ten days. Additionally, water visibility had to be acceptable (bottom of riffles were visible) over the majority of the survey area. AUC estimates were not made for surveys that did not meet these criteria.

References:

Beidler, W.M., and T.E. Nickelson. 1980. An evaluation of the Oregon Department of Fish and Wildlife standard spawning survey system for coho salmon. Oregon Department of Fish and Wildlife, Information Reports (Fish) 80-9, Salem, Oregon.

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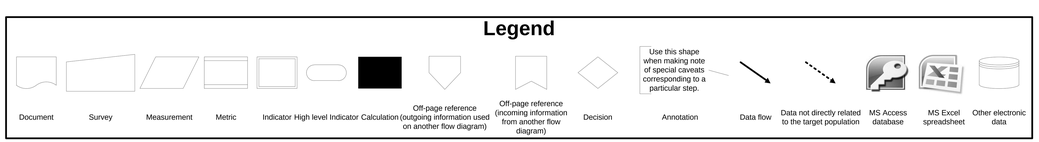
Willis, R.A. 1954. The length of time that silver salmon spent before death on spawning grounds at Spring Creek, Wilson River in 1951-52. Fish Commission of Oregon Research Briefs 5:27-31.

Creator:	Erik Archer
Date:	8/12/2011
File name:	
Notes:	Matt Weeber approved this diagram for use. A survey number of six is shown here for example only; actual number of surveys for a particular population is greater than six. Jacks are included in these estimates.

Legend



Oregon Adult Salmonid Inventory and Sampling Program (OASIS)
Variance and Confidence Interval Construction

Spawner Abundance Estimate calculated on NOSA or TSA diagram (naturally spawning)

Spawner Abundance Estimate (naturally spawning). Number of spawners per population

$(\hat{S}_P)$

Adjusted weight per population Calculated on NOSA or TSA diagrams

Adjusted weight for each population (W')

(1/W')

π

This assumes an equal probability of selection for each site. Adjustments would need to be made if this assumption is not substantiated

The values of λ and γ are calculated using a Moore-Penrose generalized inverse to obtain a unique solution of the set of linear equations to solve:

$$\min_{w_{ij},\lambda_k,\lambda_l} \sum_{i,j} (w_{ij} - \tilde{w}_{ij})^2 + \sum_k \lambda_k \left(\sum_i w_{ij} - 1\right) + \sum_l \gamma_l \left(\sum_k w_{jk} - 1\right)$$

where :

$$\tilde{w}_{ij} = \frac{w^*_{ij}}{\sum_{s_k \in D(si)} w^*_{ik}}$$

For illustration purposes this diagram calculates the variance within a neighborhood set (D(s*1*) of 4 survey sites (1,2,3,4). In application a D(s*i*) can contain more than 4 survey sites and each population consists of a D(s*i*) for each survey site.

Rank survey sites with respect to distance from site i with site i receiving a rank of 1 (r)

D(s1) Calculated on Dsi diagram

D(s*1*)

Count the number of survey sites in D(s*1*) (*n*)

$$w^*_{11} = \frac{1-(r_{(s1)}-1)/n_{D(si)}}{\pi}$$

$$w^*_{12} = \frac{1-(r_{(s2)}-1)/n_{D(si)}}{\pi}$$

$$w^*_{13} = \frac{1-(r_{(s3)}-1)/n_{D(si)}}{\pi}$$

$$w^*_{14} = \frac{1-(r_{(s4)}-1)/n_{D(si)}}{\pi}$$

$$w_{11} = w^*_{11} + \frac{\hat{\lambda}_1 + \hat{\gamma}_1}{2}$$

$$w_{12} = w^*_{12} + \frac{\hat{\lambda}_1 + \hat{\gamma}_2}{2}$$

$$w_{13} = w^*_{13} + \frac{\hat{\lambda}_1 + \hat{\gamma}_3}{2}$$

$$w_{14} = w^*_{14} + \frac{\hat{\lambda}_1 + \hat{\gamma}_4}{2}$$

$$w_{11}\left\{\frac{s_{s1}}{\pi} - \left(w_{11}\frac{s_{s1}}{\pi} + w_{12}\frac{s_{s2}}{\pi} + w_{13}\frac{s_{s3}}{\pi} + w_{14}\frac{s_{s4}}{\pi}\right)\right\}^2$$

$$w_{12}\left\{\frac{s_{s2}}{\pi} - \left(w_{11}\frac{s_{s1}}{\pi} + w_{12}\frac{s_{s2}}{\pi} + w_{13}\frac{s_{s3}}{\pi} + w_{14}\frac{s_{s4}}{\pi}\right)\right\}^2$$

$$w_{13}\left\{\frac{s_{s3}}{\pi} - \left(w_{11}\frac{s_{s1}}{\pi} + w_{12}\frac{s_{s2}}{\pi} + w_{13}\frac{s_{s3}}{\pi} + w_{14}\frac{s_{s4}}{\pi}\right)\right\}^2$$

$$w_{14}\left\{\frac{s_{s4}}{\pi} - \left(w_{11}\frac{s_{s1}}{\pi} + w_{12}\frac{s_{s2}}{\pi} + w_{13}\frac{s_{s3}}{\pi} + w_{14}\frac{s_{s4}}{\pi}\right)\right\}^2$$

Sum

Variance Estimate $\hat{V}_{NB}(\hat{S}_P)$

$\sqrt{\hat{V}_{NB}(\hat{S}_P)}$

Standard error (se)

1-α percentile of the normal distribution ($z_{(1-\alpha)}$)

For a 95% confidence interval (CI) $z_{(1-\alpha)}$=1.96, for a 90% CI $z_{(1-\alpha)}$=1.65

$$\hat{S}_P + (se * z_{(1-\alpha)})$$

$$\hat{S}_P - (se * z_{(1-\alpha)})$$

Confidence Interval for spawner abundance of a population

Estimated number of live wild adult fish (naturally spawning) per stream segment miles. Calculated on NOSA or TSA diagram

Estimated number of live wild adult fish (naturally spawning) per stream segment miles for survey site 1 (s_{s1})

Estimated number of live wild adult fish (naturally spawning) per stream segment miles for survey site 2 (s_{s2})

Estimated number of live wild adult fish (naturally spawning) per stream segment miles for survey site 3 (s_{s3})

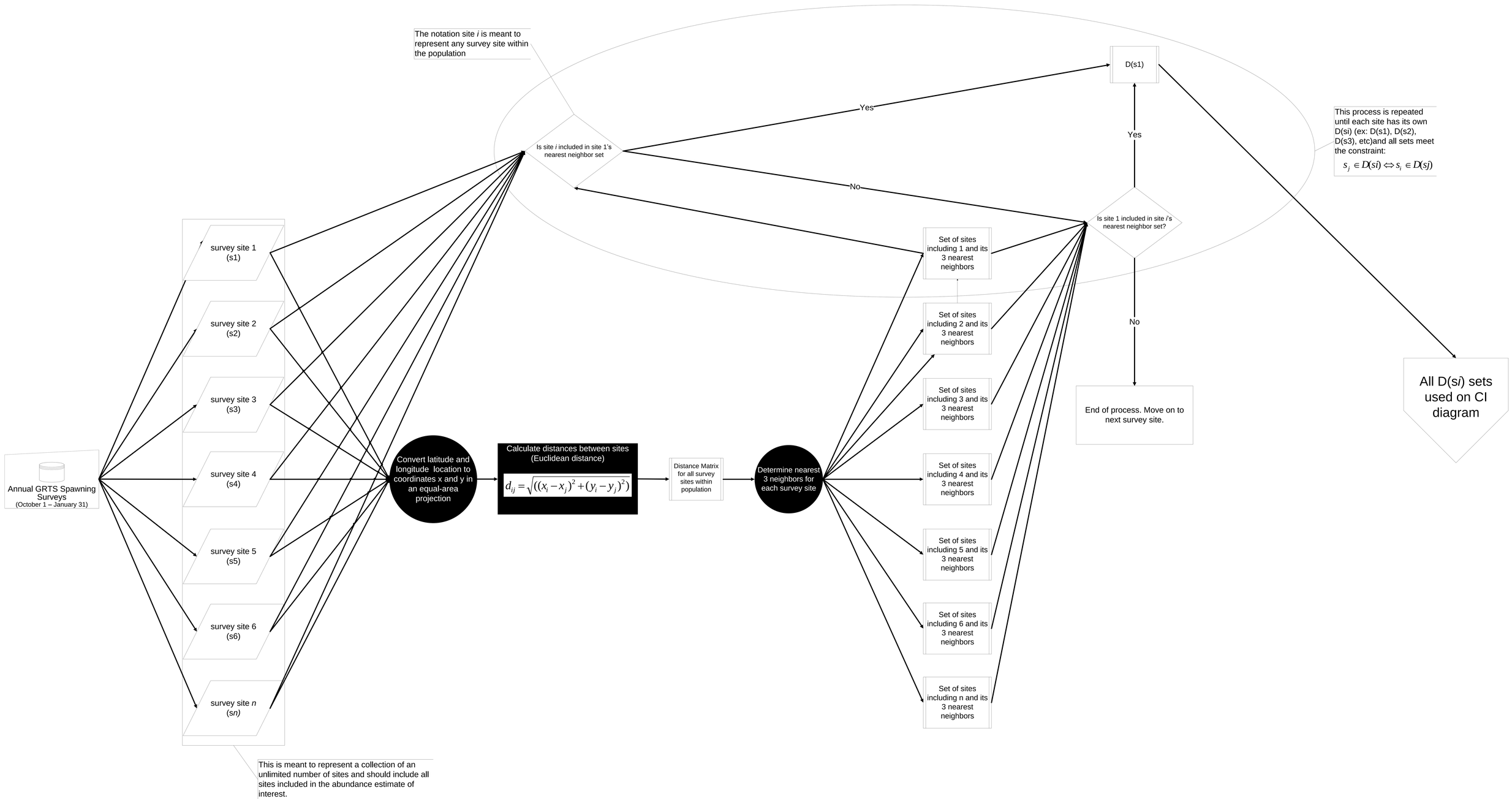
Estimated number of live wild adult fish (naturally spawning) per stream segment miles for survey site 4 (s_{s4})

Creator:	Stephanie Archer, Nadine Craft
Date:	10-11-2011
File name:	
Notes:	Approved by Tom Kincaid 10/26/2011.

Legend

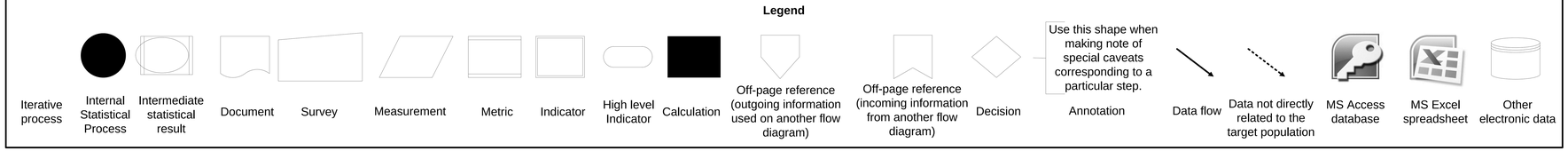
Iterative process | Internal Statistical Process | Intermediate statistical result | Document | Survey | Measurement | Metric | Indicator | High level Indicator | Calculation | Off-page reference (outgoing information used on another flow diagram) | Off-page reference (incoming information from another flow diagram) | Decision | Use this shape when making note of special caveats corresponding to a particular step. Annotation | Data flow | Data not directly related to the target population | MS Access database | MS Excel spreadsheet | Other electronic data

Oregon Adult Salmonid Inventory and Sampling Program (OASIS) Site Neighborhood Construction



Creator:	Stephanie Archer
Date:	10-10-2011
File name:	
Notes:	Approved by Tom Kincaid 10/26/2011. All calculations are performed internally in a statistical package.

Legend



The first four years of estimates (2002-2005) in the LCR Coho ESU were done at the scale of six population complexes. The eight LCR Coho ESU populations as defined by NMFS represent a refinement of the six LRC coho population complexes. Boundaries are the same for four populations/ complexes (Clatskanie, Scappoose, Clackamas, and Sandy), with the Astoria Complex divided into the Youngs Bay and Big Creek populations, and the Bonneville Complex divided into the Lower Gorge and Hood River populations. Since 2006 LCR coho estimates have been done at the coho population scale and the 2002 through 2005 estimates were recalculated at the population scale.

Utilizing Geographic Information System (GIS) software, an integrated frame of potential sampling sites (points) for the OC and SONCC Coho ESUs was established in 1998 (98 Frame). The Generalized Random Tessellation Stratified (GRTS) points were established on a 1:100,000-scale digital line graph of streams at a density of approximately two points per mile of stream. Each point is attributed to one or more of three subsets which determine which projects (AIP, OASIS, and WORP) sample there. Each point is also assigned to one of 40 rotating panels. The rotating panel design is based on the three year life span of coho salmon and intended for a 27 year study duration. The 40 panels are assigned to 4 groups: 1 panel contains sites that are sampled every year; 3 panels have sites that are sampled every third year; 9 panels have sites that are sampled every 9 years; and 27 panels have sites that are sampled only once (Firman and Jacobs 2001, and Stevens 2002). The 98 Frame only attributed GRTS points in areas of assumed high and moderate coho spawner density as coho spawning survey (OASIS) sites. In 2002 a similar process was used to establish a GRTS sampling frame for the LCR Coho ESU. The LCR frame, unlike the OC and SONCC Coho ESU frames, included all GRTS points in coho spawning habitat as potential spawning survey sites without regard to assumed coho spawner density. However, it did not initially include a rotating panel design. Panels were added with sites were re-drawn during the 2007 frame revision.

Conducting spawning surveys only in habitat assumed to be better for coho spawning in the OC and SONCC Coho ESUs, focused effort in areas most likely to have coho and was an attempt to obtain the most information on coho spawners given limited resources. However, this limited our ability to document overall distribution of spawning coho, document expansion of coho into "marginal" habitats as abundance increased, or evaluate the actual density of coho spawners in the areas of assumed low density. To address these concerns a one-time addition to the 98 Frame was established in 2005 (05 Frame). This provided GRTS sample points in 1,999 miles of potential spawning habitat in areas assumed to have low coho spawner densities. However, the 05 Frame did not include a panel structure. Beginning in 2005, sample points were selected from the 98 Frame as usual, and then points were replaced (based on use order) by sample points selected from the 05 Frame. This process continued until the sample weight (miles of habitat in the frame/sample points selected) was the same for the 98 and 05 Frames. Due to time constraints we were only able to do this for the Umpqua stratum in 2005, but all the 2006 sample points for the OC Coho ESU were selected using this process.

The 05 Frame was a stop gap measure while a more permanent means was developed to sample the areas assumed to have low coho spawner density. A long-term solution needed to accomplish several goals. First, by 2006 we had completed 9 years of sampling under the rotating panel design. This meant that we had 9 years invested in the annual panel sites, three cycles of sampling for the three 3 year panels, and one cycle of sampling for the nine 9 year panels. Simply adding GRTS points in the low coho spawning density sites and then reestablishing all 40 panels could jeopardize this investment in time and effort, and compromise our trend detection abilities. Secondly, we wanted to transition from the 1:100,000-scale stream network that had been used to generate the 1998 sample to a 1:24,000-scale digital line graph of streams. This would improve our accuracy in determining survey lengths and locations, as well as identifying smaller streams that were not included in the coarser scale coverage. Finally, after 9 years of sampling by three projects we had identified a significant number of corrections, additions and deletions to our coho spawning habitat area. Staff from all three OPSW projects (AIP, OASIS, and WORP) developed a new 1:24,000-scale frame (07 Frame) and worked with staff from the Oregon State University (OSU) Statistics Department to establish a new draw of survey sites (07 Draw). In making the new draw we decided to maximize retention of sites that had been previously sampled and replace panels that had not yet been sampled (Stevens in prep). The 07 Draw has been used since 2007 (Table 1). This same effort is needed for the SONCC coho frame. However, it has not been done, and we are still using the 98 Frame for selecting coho spawning survey points in the SONCC Coho ESU.

Lewis, M., E. Brown, B. Sounhein, M. Weeber, E. Suring, and H. Truemper. 2009. Status of Oregon stocks of coho salmon, 2004-2008. Monitoring Program Report Number OPSW-ODFW-2009-3, Oregon Department of Fish and Wildlife, Salem, Oregon.

The total number of miles per population (or frame miles per population) is the number of miles the estimate can be expanded to (i.e. the scope of inference). It is an estimated number based on professional opinion plus extensive field verification. Original mileage estimates came from the EPA Reach File (Horn 1986) and ODFW's Planning Form File (further detail can be found in Jacobs and Nickelson, 1998). The frame is regularly re-evaluated. When changes to coho spawning distribution are made, existing sites are re-attributed to reflect the attributes of the underlying stream layer (e.g. if a stream reach formerly identified as rearing habitat only is found to have spawning habitat, the stream reach and any points falling on it are re-attributed as: Spawn).

The frame miles and counting stations for the 8 Lower Columbia coho populations are pasted below. The frame miles are kept in an Access table.

Coho Pop - Frame Miles - Counting Stations

Youngs Bay – 64.48 - Klaskanine Hatchery
Big Creek – 43.58 - Big Creek Hatchery
Clatskanie River – 60.05 - N/A
Scappoose Creek – 75.73 - Bonnie Falls Wier Trap
Clackamas River – 248.83 - North Fork Clackamas Dam
Sandy River – 110.38 - Sandy Hatchery and Marmot Dam (prior to 2007)
Lower Gorge Tribs – 5.61 - N/A
Upper Gorge Tribs – 3.77 - N/A
Hood River - 4.9 - Powerdale Dam (prior to 2010)

Hatchery counts from counting stations are added to GRTS estimates and reported to the OPITT that sets harvest limits each year. The final indicator of Natural Origin Spawner Abundance can be found on the Abundance sheet (http://oregonstate.edu/dept/ODFW/spawn/pdf%20files/coho/AnnualEstLC2002-2010.pdf). The hatchery counts that are added to GRTS estimates are pulled from the Hatchery Management Information System (HMIS) for Youngs Bay (Klaskanine Hatchery), Big Creek, and Sandy. The data are error checked but no manipulations are done to the data. The North Fork Clackamas Dam counts come from the following website: http://www.portlandgeneral.com/community_environment/initiatives/protecting_fish/clackamas_river/fish_count_archives.aspx or by contacting someone at PGE directly. The Marmot dam counts (Sandy River) are also received by contacting someone at PGE directly. The Bonnie Falls Trap count (Scappoose River) comes from the Corvallis Research Lab's Life Cycle Monitoring Project. The Powerdale Dam count (Hood River) comes from contacting someone at the ODFW office in The Dalles. Counts are normally gathered twice per year; February to add to the "preliminary" estimates and again in April, May, or June to add to the "Final" estimate. Proportion 1 and proportion 2 are calculated for each of the populations regardless of the number of carcasses recovered.

Definitions:

1) Total population frame miles = the estimated number of miles of spawning habitat per population (based on professional opinion and extensive field verification).

2) No. of sites attempted = all the random sites drawn for the year = response sites + non-response sites + non-target sites. This number can vary depending on budgets and crew availability.

3) Response sites = those sites classified as "surveyed." Meaning an AUC estimate was generated and no survey gap rules were violated (i.e. no survey gaps >= 16 days apart and no greater than one gap 12 -15 days apart)

4) Non-response sites = those sites which were "denied" access, or "inaccessible" due to time constraints/survey danger, or "dropped" due to survey complications, or "No AUC"ed due to lack of surveys/gaps in survey rotation

5) Non-target sites = those sites deemed "Zero" spawning habitat either because they are above a barrier or lack suitable spawning gravel.

Table 1. Design criteria used in selecting GRTS sampling points for **coho** spawning surveys. Points = scale for precision targets; Estimate = finest scale at which population estimates were made; Frame scale = the scale of the GIS stream coverage used to select GRTS points; Panels = sites assigned to a rotating panel design; Pop. Complex = population complex; Popn = TRT coho population.

Run Year	Geographic Scale		Frame Scale	Panels
	Points	Estimate		
2002	Pop. Complex	Popn*	1:100K	No
2003	Pop. Complex	Popn*	1:100K	No
2004	Pop. Complex	Popn*	1:100K	No
2005	Pop. Complex	Popn*	1:100K	No
2006	Popn	Popn	1:100K	No
2007	Popn	Popn	1:24K	Yes
2008	Popn	Popn	1:24K	Yes
2009	Popn	Popn	1:24K	Yes
2010	Popn	Popn	1:24K	Yes
2011	Popn	Popn	1:24K	Yes
2012	Popn	Popn	1:24K	Yes
2013	Popn	Popn	1:24K	Yes
2014	Popn	Popn[1]	1:24K	Yes

* est. was initially made for the Pop. Complex and was recalculated at the population scale

[1] Youngs Bay and Big Creek populations were not sampled in this year.