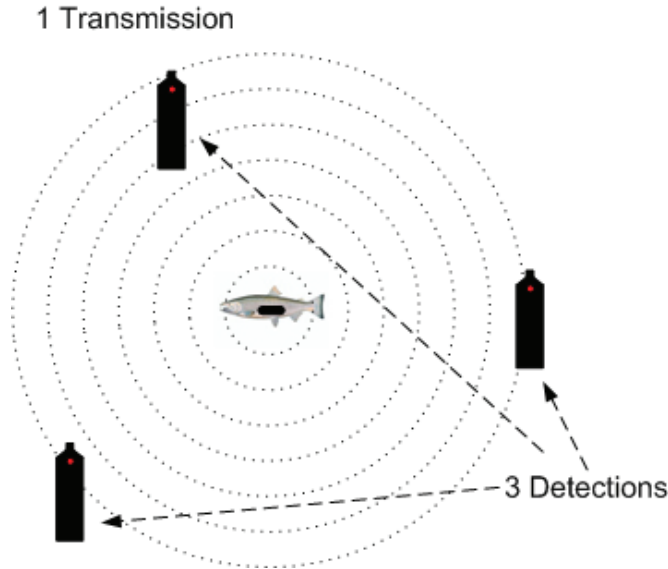


VEMCO Positioning System (VPS)



A low cost, non-real-time underwater acoustic fine-scale positioning system



The **VEMCO Positioning System (VPS)** is a low cost, non-real-time underwater acoustic fine-scale positioning system, using the same off-the-shelf equipment used in conventional coded receiver-based studies.

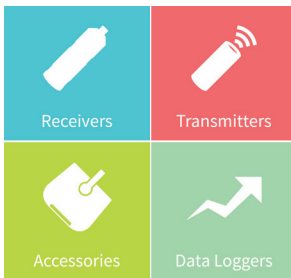
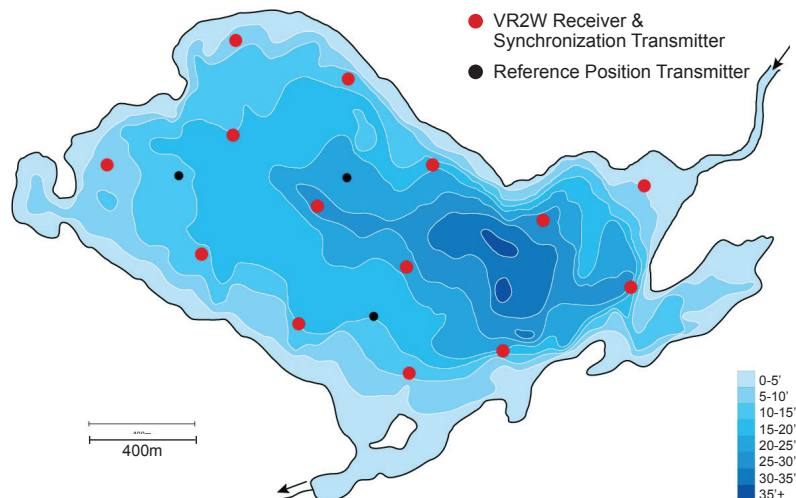
lated positions, and may recommend changes to the design of the system to address performance issues. At the end of the study, once all receiver data has been collected, VEMCO will provide a final report and calculated positions.

The system consists of underwater acoustic transmitters and receivers that are deployed by you, and a receiver data processing service provided by VEMCO.

For most studies, VEMCO expects position accuracy similar to that provided by the GPS standard positioning service: 95% of positions within a 15-metre error circle. VEMCO considers this a conservative estimate, based on results from field studies conducted to date. Depending on the specifics of the study, significantly better accuracy is possible.

VEMCO will work with you to design a system layout in accordance with a set of design guidelines. You then deploy your system and collect receiver data periodically. Receiver positions can be measured using a handheld GPS unit.

On a periodic basis, you collect your receiver data, and send it to VEMCO for analysis. As a result of this analysis, VEMCO will provide interim calcu-



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System Design Overview

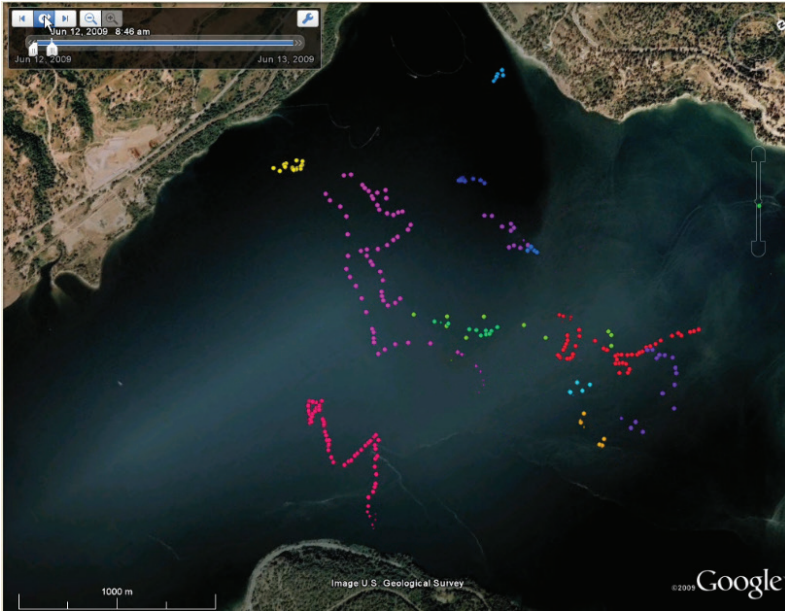
Receivers are placed in a grid of triangles and squares. The objective is to ensure that every tag transmission is detected by at least 3 receivers (more is better). Ideally the area of interest is covered with enough receivers to ensure that animals are always inside of a triangle of receivers. Users will need to ensure that the receivers are placed close enough together to have greater than 100% overlap in detection range to account for worst case conditions.

Synchronization tags, “Synctags”, are moored along with each receiver to correct for clock drift between submerged receivers.

Additional reference tags are placed within the receiver grid in known measured locations to measure system performance.

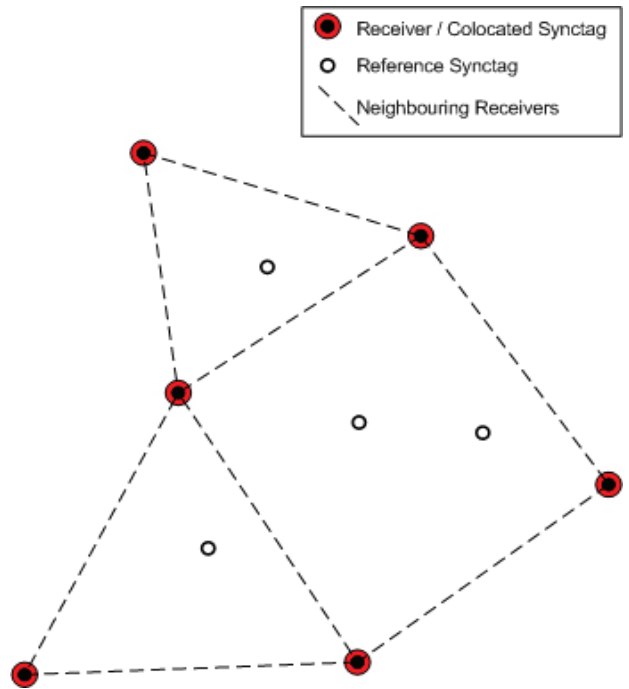
Final positioning data will be provided to the user from VEMCO as shown in the Sample Output File below. **Output files can be imported to a variety of visualization tools!**

For your convenience, we also provide KMZ output files to enable you to quickly and easily visualize your position data in Google Earth.



Principal Investigators: Jason McLellan / Matt Howell
Washington Department of Fish and Wildlife

Funding provided by the Washington Department of Ecology and US Geological Survey



Sample Output File

	A	B	C	D	E	F	G	H
1	TRANS	DETECTEDID	DATETIME	X	Y	D	LAT	LON
2	T01	A69-9002-1335	2009-11-03 05:10	960.7	999.4	1.978	33.44486	-118.48606
3	T01	A69-9002-1335	2009-11-03 05:32	916.8	991.1	1.758	33.44479	-118.48653
4	T01	A69-9002-1335	2009-11-03 05:37	919.1	992.7	1.319	33.44480	-118.48650
5	T01	A69-9002-1335	2009-11-03 05:46	918.2	993.0	1.319	33.44480	-118.48651
6	T01	A69-9002-1335	2009-11-03 05:47	934.0	974.2	1.538	33.44463	-118.48634
7	T01	A69-9002-1335	2009-11-03 06:05	915.8	989.1	1.099	33.44477	-118.48654
8	T01	A69-9002-1335	2009-11-03 06:39	933.3	913.9	1.538	33.44409	-118.48635
9	T01	A69-9002-1335	2009-11-03 06:45	939.4	944.2	0.879	33.44436	-118.48628
10	T01	A69-9002-1335	2009-11-03 06:56	927.9	902.2	1.319	33.44399	-118.48641

For more information on VEMCO’s VPS and to discuss your positioning study requirements, contact your VEMCO sales representative today!

