ONRC UPDATE

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A Monthly Newsletter from UW Olympic Natural Resources Center

DIRECTOR'S MESSAGE

John Calhoun

"What have you done for us lately?" This is a question I hear, in one form or another, from time to time. Since UW ONRC does not have direct responsibility for natural resource management decisions as a state agency or landowner might, it is easy for us to slip "under the radar screen" of public awareness. Most folks who care about natural resource management in our region are aware of UW ONRC and have an idea of our mission. But many people wonder what we have actually accomplished.

The *ONRC Update* newsletter is one strategy to keep interested people informed of our activities, events, and research results. But, I believe there is a need for more definitive documentation of our recent accomplishments.

Ellen Matheny, UW ONRC Director of Education and Outreach, and I are producing a report that will respond to the question, "What have you done for us lately?" UW ONRC has a terrific story to tell. Sometimes, however, we get so preoccupied in accomplishing things that we forget to share with others information about what we are doing. We have made outstanding contributions in areas such as useful forestry research and planning, estuary restoration support, razor clam monitoring, and teacher education. Our contributions to watershed planning efforts, natural resource education, and community support are also significant.

Ellen and I will present the report in several formats. We will create a MS PowerPoint presentation to be posted on our web site and used in community meetings. Also, a brochure, containing similar information, will be available for distribution and for download from the web site.

Using this information, UW ONRC plans to expand our communication efforts beyond our current audience. Now we do a pretty good job of posting information on our web site—although not in the summary format we are contemplating now—and we often speak to local groups in Forks about UW ONRC. We can expand our outreach to larger regional audiences in Grays Harbor County, the Willapa Bay area, Port Angeles, and Jefferson County, including elected officials and their staff in these presentations.

We anticipate this new strategy will help others in the region become increasingly aware of UW ONRC's significant contributions to research in forestry and the marine sciences as well as our efforts in community outreach and education.

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OESF Corner

Al Vaughan
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In February's *ONRC Update*, the Washington State Department of Natural Resources (DNR) said it hoped to initiate research and monitoring with operations that involve cedar salvage in Northern Spotted Owl (NSO) habitat. That work is nearing completion. Three sales totaling 2000 acres should be offered starting in May 2004. The estimated value for each sale is $200,000.

The original proposal for the sales outlined some Habitat Conservation Plan (HCP) research needs:

- Studies are needed to understand the relationship between large woody debris and its contribution to NSO habitat. This is outlined in DNR's HCP as one of four primary research interest areas.
- The Olympic Experimental State Forest's (OESF) goal is to integrate commodity (income) production for its trust beneficiaries with protection and restoration of ecological values.

DNR contacted UW ONRC to ask for its help in identifying opportunities for research and monitoring that would address the HCP's primary research interest. Jason Cross, UW ONRC Research Coordinator, completed a report titled, "Goodman Creek Cedar Salvage, Recommendations for Associated Monitoring and Evaluation." Cross discovered there is very little scientific research linking large course woody debris (CWD) to ecological functions in the forest. Cross' recommendation for the cedar sale was "to provide a tandem of CWD surveys, before and after the sale." This will provide a baseline of data for future studies on CWD ecological effects. His recommended surveys will be an important part of the cedar sale contract.

New Benefit from Proposed Study: Another issue cropped up since last February - cedar theft and trespass in the vicinity of the proposed study. Last February's article presented a picture of a down cedar tree. The picture depicted the type and amount of material on the forest floor and helped illustrate the challenge of the OESF to find balance between economic value recovery and habitat conservation. The BEFORE and AFTER photos below show the same tree sliced into blocks of cedar. Thieves cut up this tree and a dozen other standing large cedar trees (see stump) during late evening and weekend operations. Economic losses were estimated at over $50,000. The losses to the habitat are unknown.

The OESF is part of the comprehensive HCP with the United States Department of Fish & Wildlife. These cedar losses are important to the habitat as well as providing income. DNR felt it must address this theft and hired a watchman. The new watchman's duty hours enable him to patrol the area with an emphasis on late night and weekend time periods. He will work cooperatively with DNR and county law enforcement agencies.

BEFORE and AFTER the theft

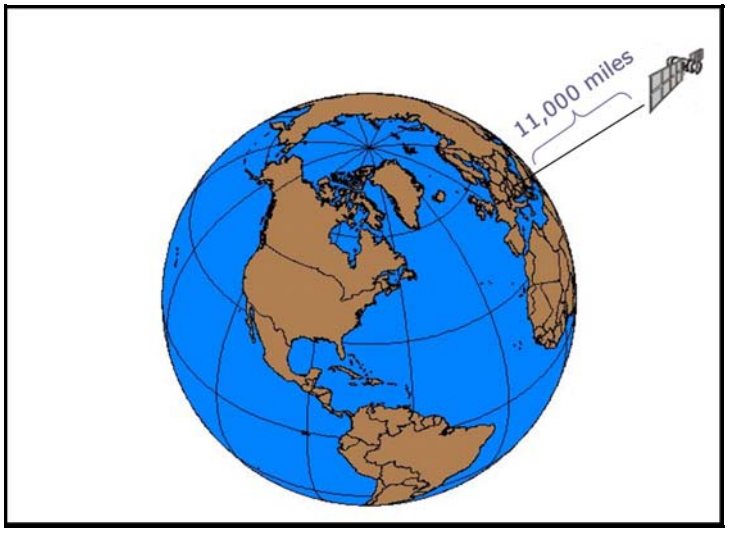
Al Vaughan

What is the impact to habitat from poaching activities? First, it is hoped the study UW ONRC has suggested and DNR will implement with the coming sales will begin the groundwork to help measure impacts on habitat resulting in large down wood removals (in this case, a theft). Secondly, there is an added benefit from the study relative to trespass activity. The contractor will automatically provide added security for this area based on their own interests in protecting their investment. The serendipity: Having a people presence in the woods that provides both economic benefit and protection of key habitat structures. The OESF is charged to find balance…. perhaps balance has found us this time.

The UW ONRC and DNR will continue to work together. The CWD study above will provide new knowledge about the ecological values large down wood provides for the forest. But, as we embark on studies, perhaps additional unknown benefits will begin to appear. Who would have thought a scientific study would not only help us create new data for CWD studies but would also provide an opportunity to better protect our forest values.

GPS@Home (Part 2 of 3): GPS Technology

Eric Sfetku
GIS Technician
UW Olympic Natural Resources Center



Last month, I discussed the history of Global Positioning Systems (GPS). This month, we will explore how all of that Cold War technology works to provide you with an accurate set of coordinates on the ground. To begin with, there are three major components working together to tell you where you are: space, control, and ground.

SPACE

The space component is probably the most noticeable yet least understood part of the entire GPS equation. When most people hear about GPS in the news, they think of satellites in orbit. But, they probably couldn't tell you any specifics about how they work. It may be hard to believe but the concepts are quite easy to understand as it is an amazingly practical system.

The 24 satellites, each 11,000 miles above the earth's surface, have two onboard instruments. The first instrument is an atomic clock that does nothing more than keeps an accurate assessment of the time. Einstein's Uncertainty Principal states that humans cannot directly view sub-atomic particles that make up an atom without affecting them. However, we can predict the time it takes electrons to move around the nucleus of an atom. Since the beginning of time, electrons have rotated around protons in an orderly fashion at the same speed. In the past century, scientists have harnessed this extremely accurate process to create highly accurate clocks. As the electron makes a revolution around the nucleus of an atom, it is recorded as the tick of a clock. This assessment of time is then translated into its numerical representation (i.e., 12:05:23). The latest atomic clocks use cesium atoms and are accurate to within one second every 20 million years.

The second instrument onboard the satellites is a radio broadcast transmitter. Your car radio receives FM radio transmissions from broadcast towers in the hills with frequencies ranging from 88 to 108 MHz. The GPS satellites work in the same fashion, but they broadcast from space at a frequency of 1575.42 MHz. The sole purpose of this radio transmitter is to transmit the time from the atomic clock.

NAVSTAR GPS DIGITAL IMAGE

CONTROL

While the instruments onboard these satellites are reliable, they are not fail-safe. Military personnel must constantly monitor these satellites to ensure they are fulfilling their missions. In addition to possible computer problems, satellites are also in constant danger of dropping out their orbits. The vacuum of space isn't entirely empty, especially around the earth. Satellites incur small amounts of friction, just as a plane or a car does, that cause it to slow down. As it slows, it begins to drop out of orbit back to earth. This can have terrible effects on the length of time it takes the radio signal to reach you as well as the risk of one satellite colliding with another and crashing to earth. Round-the-clock surveillance of every satellite is necessary to make sure that their paths aren't altered and that all systems are functioning normally.

GROUND

The ground component consists of a GPS receiver. Today these useful tools can be purchased for under a hundred dollars and will tell you where you are, up to within 100 feet of your actual position. A GPS receiver works under the same principle as your car radio except it is specifically tuned to the frequencies broadcast by the GPS satellites. When your GPS unit receives a signal from a satellite, it compares the time broadcast with the time on its internal clock. For instance, the satellite broadcasts 12:05:23.273 while your receiver has a time of 12:05:23.337, a difference

(Continued on page 4)

GPS@Home (Part 2 of 3): GPS Technology

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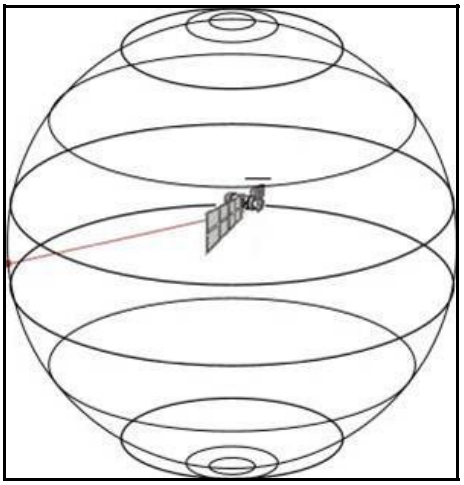
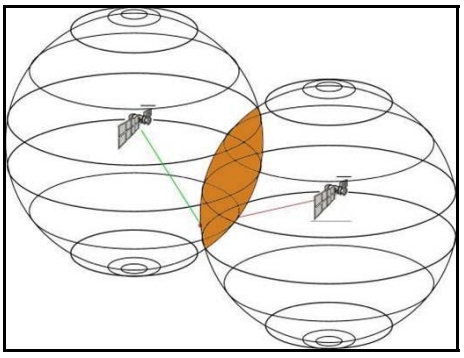


of 6.4 hundredths of a second. Your GPS receiver now has two bits of information it can use in a mathematical equation to give it the distance to that satellite. The equation is: TRAVEL TIME X SPEED OF LIGHT = DISTANCE. Using the above numbers as an example, we can calculate the distance to one satellite.

0.064 seconds x 186,282 miles per second = 11,922.048 miles from the satellite to receiver

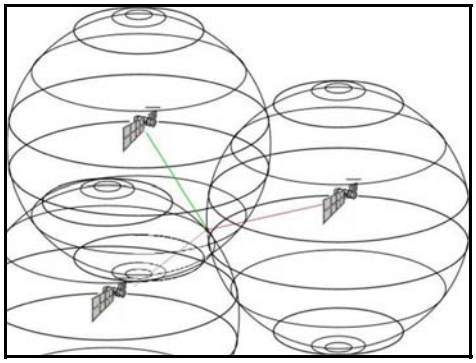
TRILATERATION

While the distance from one satellite provides some information, it is useless by itself because no directional information is passed from the satellite to the GPS receiver. However, a technique called trilateration allows one to compute coordinates from distances. This methodology is



used to calculate your position on the ground.

Let's say we do another calculation on a second satellite to get its distance. The only rational solution to both equations is at the spots where the two signals overlap. This narrows your position down from three to two dimensions, but it still covers millions of square miles. It takes another calculation, using a third satellite, to give you an accurate reading. Mathematically, there are only two solutions to all three equations that make sense. One defines your place on the earth and the other locates you about 5000 miles out in space. Your GPS receiver knows to toss out the second number, leaving you with your position on the ground. A fourth satellite is used to cancel out clock error, increase accuracy, and to provide an altitude reading.



LIMITATIONS & INCONSISTENCIES

While this process is practical, it is not perfect. With a GPS receiver costing under $300, the receiver will only show your location accurate to within 100 feet. However, this level of accuracy will enable you to get back to your campsite after a long day of hiking, for instance.

There are several reasons as to why a recreational GPS receiver is only accurate to within 100 feet. In the past, the US military inserted an algorithm that degraded the quality of the transmitted signal from the satellites. In May 2000, that algorithm (called Selective Availability) was turned off, giving recreational users much more consistent readings. Of course, it is possible for the military to switch Selective Availability on at any time, if necessary.

Other more natural reasons as to why your GPS isn't perfect are static interference in the ionosphere and water vapor. As the radio signal travels down to earth, it has to pass through a highly-charged region of our atmosphere. The charged particles of the ionosphere work like a giant electromagnet that bends and distorts the GPS signal. Fortunately, this distortion is predictable and can be accounted for in the higher end recreational GPS receivers.

Water vapor is a major problem for GPS radio signals. The more water vapor contained in the air, the greater the distortion. This problem occurs because water is very reflective. Everyone who has been to the beach or a lake on a hot summer day knows the sun's rays reflect off of water. The same concept is true for radio signals traveling through the lower atmosphere.

If radio signals bounce around when they pass through water, imagine what they do when they hit something solid like a building. The final major cause for error in a receiver is called multipathing. Multipathing is as simple as a signal bouncing off something solid before it gets to your receiver. More expensive GPS receivers, such as those used by scientists and engineers, have complex software to help minimize all of these problems. The good news is, for under $300, you can enjoy a tool that will be a valuable aid for you in most of your outdoor activities.