



Survey Protocol

Summary

Seabird research in Puget Sound has historically been a collaborative process between state and federal agencies, NGOs, and university scientists. In 1978-1979, the Environmental Protection Agency (EPA) and National Oceanic and Atmospheric Administration (NOAA) jointly funded the first seabird survey in Puget Sound, known as the Marine Ecosystems Analysis (MESA). Results from the MESA study have provided an initial baseline to estimate population trends and projections in Puget Sound. Beginning in the early 1990s, the Washington Department of Fish and Wildlife (WDFW) made seabirds a conservation priority and began a series of continuous annual surveys to estimate temporal trends in seabird abundance. These data have been incorporated into the Puget Sound Assessment and Monitoring Program (PSAMP); results indicate that nearly all species have declined since 1978-79. One potential problem with comparing WDFW surveys with the MESA density estimates is that the sampling protocol has been slightly different. To address this issue, a Washington State Sea Grant funded survey was established in 2004-05 to replicate the initial MESA project (J. Bower, Western Washington University). Preliminary results from the WWU survey agree with the PSAMP trends to some degree, but also show different trends for some species, including pigeon guillemots (declined 55% in the PSAMP survey, increased 60% in the WWU survey). These discrepancies indicate the need for additional research and continuous shore-based surveys of Puget Sound seabirds.

Objectives

1. The goal of the Seattle Audubon surveys is to develop long-term baseline shore-based density estimates for seabirds in central and south Puget Sound. The previous continuous study (PSAMP) estimated group sizes and species composition of groups from aerial and ship-based surveys.
2. Given the initial success of the surveys, Seattle Audubon is developing partnerships with other regional Audubon chapters, local NGOs, and local, state, and federal government agencies to create a framework for long-term seabird monitoring in Puget Sound.

NUTS AND BOLTS

What: Puget Sound Seabird Survey for wintering seabirds (*see protocol below*)

Who: Citizen scientists, preferably in teams of two.

When: The first Saturday of every month, October through April. Count to take place within two hours on either side of high tide, thus creating a 4-hour window. Please see the specific times at the end of the protocol. Minimum of 15 minutes and a maximum of 30 minutes per site.

Where: Pre-selected survey sites in Puget Sound, at least one mile apart.

Why: The Puget Sound Seabird Survey is the ONLY multi-month seabird survey in central and south Puget Sound.

Data for surveys can be entered online: http://birdweb.org/Birdweb/seabird_survey/login.aspx

The Puget Sound Seabird Survey is based on the protocol used by [Bird Studies Canada](#) in the British Columbia Coastal Waterbird Survey (BCCWS, <http://www.bsc-eoc.org/regional/bcwaterbirds.html>).

WHO:

Volunteer skills and equipment

- Surveyors must be comfortable identifying all waterbird species that regularly occur in the survey area. If you are unsure about your ability, please accompany an experienced observer. **Performing surveys in pairs is recommended.**
- To adequately view and identify waterbirds from the shoreline, surveyors need at least binoculars or a spotting scope, but preferably both. Optical equipment should be good enough to identify birds up to at least 300m from the shoreline in good conditions.
- **Observers will also be required to attend a short training session with Seattle Audubon staff prior to their first survey.** A short, informal quiz will also be required. Contact your local PSSS organizer for information about training session scheduling in your area.

What if I cannot visit every month?

We are only conducting surveys once per month so consistency is paramount if we want to collect valuable data. However, in the event of illness or other unforeseen circumstances, please contact team members or the local PSSS leader so that a qualified alternate can be found. If one cannot be found, the survey for that month will have to be missed and can resume on the next scheduled date upon your return.

WHAT:

What bird species are we counting?

We are counting all species of coastal seabirds/waterfowl including *geese, ducks, swans, loons, grebes, cormorants, gulls, terns* and *alcids*. Raptors can affect waterfowl distribution so the presence of any hawks, eagles or falcons are recorded separately at the end of the recording form.

What do we record?

At each site, observers will be asked to remain in a fixed location for at least 15 minutes and no longer than 30 minutes. The boundary for the survey area is 300m from shore, within which observers should record the following data (for the bird families listed above):

- **Species ID and count**
- **Distance down from the horizon in millimeters** (*see page 3*)
- **Bearing** (*approximate sighting angle - see page 3*)
- **NEW -- Sex ratio when males and females can be differentiated in the field** (*e.g. scoters, goldeneyes and other sexually-dimorphic species and not species like Pigeon Guillemots and Canada Geese, etc.*) -- **NEW**

If you are not sure which side of the 300m boundary a bird is on, record it just to be safe. Three hundred meter reference points are selected at each survey site and pictured in the survey site description handouts.

OPTIONAL: After the 30 minute maximum has been reached, observers can record the presence of any additional species in flight and/or outside the 300m survey boundary. Simply write down the species name and "check" the checkbox. Notes can be added. **NOTE: THIS IS OPTIONAL AND SPECIES OUTSIDE THE SURVEY AREA SHOULD NOT DISTRACT SURVEYORS DURING THE SURVEY.**



A. Survey area (within 300m)

Time: 15-30 min

Species: any PSSS species on water

Distance/Bearing? YES

B. Optional

Time: only AFTER survey has been completed

Species: any PSSS species (*in flight and on water*)

Distance/Bearing? NO

How do we count birds in large flocks?

For flocks with more than 10 birds, the distance and bearing of the entire group may be recorded along with three group size estimates: your 'best' estimate for the number of birds present, a 'max' estimate representing the maximum number of birds that may be present, and a 'min' estimate representing the minimum number of birds present.

How do we measure distance?

Measuring distance to the birds is easy; all you need is a ruler! Simply take the edge of the ruler and line it up to the edge of the horizon (or the opposite shoreline) and measure how many millimeters the birds are below the horizon. *NOTE: This measurement, with your bearing or "sighting angle" (see below) as well as initial measurements like the elevation of the site as well as your eye-height and arm length (which we will have already captured), allows us to accurately triangulate the distance from you to birds – see figure on bottom of page 4. All you need to do is write down the distance in millimeters between the birds and the horizon (see page 7).*

- **Be sure to align the "0mm" on your ruler to the horizon and only record distance in "mm".**
- **If the horizon is obscured by the weather or another structure like ferry or pier, do not record distance and check "horizon obscured" on the datasheet.**

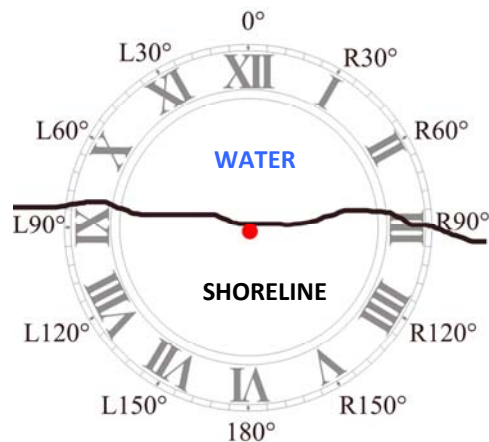
WHY IS MEASURING DISTANCE IMPORTANT?

The technique we're using to estimate bird density is 'distance sampling'. This method has been applied to hundreds (probably thousands) of species, from insects to elephants. Simply counting the number of birds in a given location is a simpler approach, but it forces scientists to assume that all birds are detected by observers. In reality, detection of any species declines with the distance from the observer: poor sighting conditions (fog, rain, etc), quality of observing equipment, and observer inexperience all contribute to declining detection likelihood as distance increases. Aquatic vertebrates (mammals, birds) are subject to unique conditions such as swell / wave height, and because some seabirds may be located underwater during survey periods, we cannot assume that every bird is detected. Distance sampling provides a robust approach to estimating density when some individuals are missed, and will allow for calculation of less biased density estimates.

NEW -- How do we measure bearing? -- NEW

Each survey team is provided with a magnetic compass that can be attached to a scope or binoculars. When a bird is spotted on the water within 300m, a magnetic bearing to the bird can be easily read directly from the compass. Measurements will be much more accurate from a scope; however accurate readings can be attained from a compass placed on top of binoculars as long as great care is taken to keep the binoculars level and pointed in the same direction as the bird (see picture on page 8).

*In the absence of a compass, please follow the following procedure: Take a compass on your first visit to your survey site(s). Pick a permanent landmark that is straight out from shore (i.e. – mountain, lighthouse on the opposite shore, etc). Use this landmark as your 0° reference point and record the exact magnetic bearing to this landmark. **Record this number bearing where it says "___ = 0° reference point" on the top of the recording form.** Record bearing as "R15" or "L55" ("right fifteen degrees" and "left fifty-five degrees," respectively). To help you estimate bearings to the nearest 5°, **place the "PSSS Bearing Sheet", available in your packet and online, at your feet with the 0° facing your reference point.** If the field of view at your survey site is greater than 180°, like on a fishing pier or spit, use the same technique as described above but imagine both sides extending back to 180°, which would be directly behind if you were facing your 0° reference point.*



WHY DO WE MEASURE BEARING?

The bearing or sighting angle is an important measurement to help us accurately estimate distance. Why? Look across the water the next time you are at your survey site: chances are the opposite shoreline does not create a straight line across the horizon. Consequently, we need to know in which direction you are looking to accurately calculate distance.

How do I measure distance and bearing of a large resting flock of waterfowl?

A flock is a group of birds that are associating behaviorally. Take measurements from the middle of the flock. Be sure to record the distance and bearing from the same point.

What about birds moving around during the survey?

If a movement of birds occurs during the survey, **focus on the birds that are on the water within 300m from the survey site**. Do your best to count birds only once. Once the survey has been completed, surveyors have the option of recording the presence of any additional species that flew through the survey area in the “optional” column of the recording sheet.

What if I see multiple individuals/flocks of the same species?

It is very likely that you will see multiple flocks or individuals of the same species during your survey. Treat each flock or individual as a separate observation, recording both bearing and distance for each. For example, if you see two different Red-necked Grebes, one at 115° and another at 193°, please record the bearing and distance for both individuals.

What if I can't see the horizon?

If you are unable to see the horizon due to fog or bad weather during your survey, DO NOT measure distance or bearing and record the reason for poor visibility at the end of the recording form. Please DO count and ID as many birds as possible. If the horizon is partially visible during the survey, DO NOT measure distance for the birds behind which the horizon is obscured and check “yes” in the “Horizon Obscured?” column. Please DO NOT measure the distance for birds which are resting above the horizon, i.e. on pilings, breakwaters, etc.

WHY MUST WE BE ABLE TO SEE THE HORIZON?

The horizon must be visible to the surveyor because it is an important variable in the formula we use to accurately triangulate the distance between the surveyor and the bird(s). Sometimes, surveyors aren't able to see the horizon due to weather. Other times, the horizon may be partially obscured by a pier, docked ferry, or advancing fog. Any of these factors can negatively affect the accuracy of your measurements, so sites are selected away from piers to reduce the chances of having an obscured horizon. This formula requires birds to be on the water: birds on structures above the horizon, e.g. pilings or piers, should be identified and counted then recorded as “horizon obscured.”

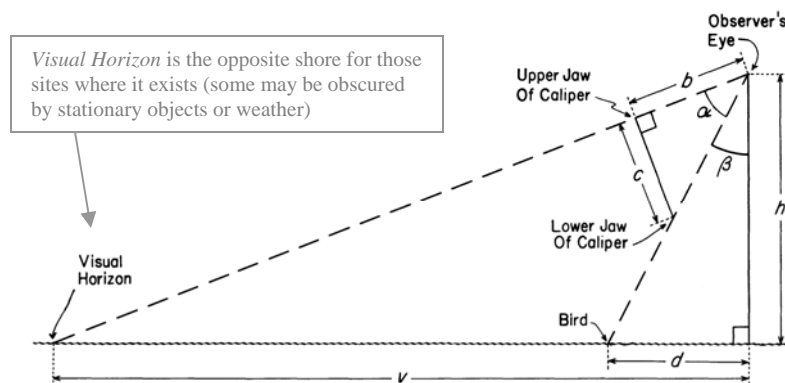


Diagram of distance sampling technique.

SOURCE: Heinemann, D. (1991). A Range Finder for Pelagic Bird Censusing *The Journal of Wildlife Management*, Vol. 45, No. 2. April 1981, pp. 489-493.

NEW -- Gathering baseline oiling rates on seabirds in Puget Sound -- NEW

If male Buffleheads are detected during the survey, please record whether or not the white portions of their bodies were visibly oiled. If no male Buffleheads were detected, please circle "N/A". If male Buffleheads were recorded and not visibly oiled, please circle "NO". If male Buffleheads present were visibly oiled, please circle "YES" and describe extent and location of oiling as well as notes on the condition of the birds.

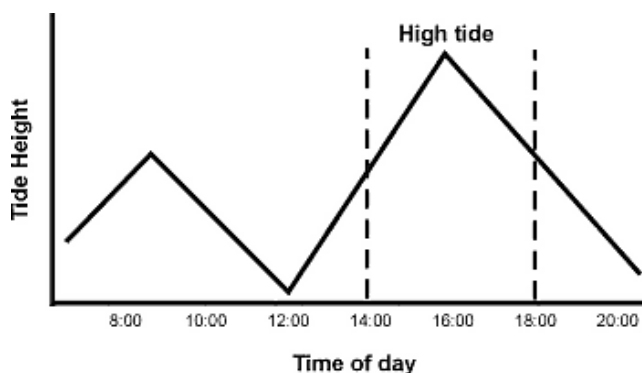
WHEN:

When do I do my Puget Sound Seabird Survey?

This is a monthly survey. To standardize counts in each area, surveyors are asked to visit their site(s) on the first Saturday of each month. The standard survey period is October through April. *The Puget Sound Seabird Survey is an eight month commitment for our volunteers. Interested volunteers are welcome to continue the survey year-round, either at their own site or at another site of designated significance. This contribution is entirely optional and not expected from our volunteers.*

What time of day?

Our surveys are completed within the period beginning 2 hours before the high tide of the day until 2 hours after the high tide of the day. This four-hour window will hopefully allow most volunteers to do several survey sites in a given area. A minimum of 15 minutes and a maximum of 30 minutes is requested at each site. Surveyors may stay longer than 30 minutes to record the presence of additional species in the "optional" column of the recording form. Do not continue the count past the four-hour window designated for that day (2009-10 dates/times are included on page 8). *If high-tide is close to either the beginning or end of the day, the 4-hour time window will be shifted to start no sooner than 30 minutes after sunrise or end no later than 30 minutes before sunset to ensure maximum visibility.*



The high tide of the day in this example is 16:00 (4 o'clock in the afternoon). Therefore, the best time to count waterbirds is from 14:00 to 18:00 (between 2 and 6 o'clock in the afternoon).

SEE PAGE 8 FOR 2009-2010 survey windows

WHY DO WE ONLY COUNT DURING A FOUR-HOUR WINDOW EVERY MONTH?

The four-hour window affords us a synchronized "snapshot" of the bird populations on Puget Sound. It also decreases the risk of double counting between survey sites. Setting a maximum survey time of 30 minutes also standardizes the amount of time volunteers can count birds. Otherwise, if Site A records greater species diversity than Site B, we won't know for certain if it is due to better habitat or greater volunteer effort. Standardizing the date, time window and survey duration reduces the number of confounding factors that would weaken the quality of the data.

Weather and Sea Conditions

Weather conditions can affect the visibility of seabirds and your enjoyment, especially in winter. Wind and rain is OK, but avoid extreme weather! It can be difficult to see birds in rough, stormy waters so please record the conditions during your survey on the last page of the recording form. If it is foggy and you are unable to see the horizon, please refrain from recording distances and note the reason for reduced visibility. However, species counts (and bearings, if possible) are still valuable. Suitable weather and sea conditions are up to the discretion of each volunteer counter, but please be mindful that, while consistency and frequency affords the most valuable data, your safety is paramount.

What if the weather is REALLY bad?

If a severe storm is predicted on a survey date, Seattle Audubon will contact you regarding the selection of an alternate day or cancelling the survey for that month altogether.

Additional Surveys

For those who have the time to contribute, we encourage you to count more than one site. We also encourage you to carry out surveys more frequently, provided that you follow the same protocol. This can provide valuable additional information on migration patterns and short-term fluctuations in numbers.

The Puget Sound Seabird Survey is a seven month commitment for our volunteers. Interested volunteers are welcome to continue the survey year-round, either at their own site or at another site of designated significance. This contribution is entirely optional and not expected from our volunteers.

WHERE:

Where are Puget Sound Seabird Survey Sites?

Survey sites are located (at least 1-mile apart) along the shoreline of Puget Sound. A survey site is considered one point on the shore. Each survey site is randomly generated by Seattle Audubon and thoroughly documented with pictures and GPS coordinates. Shoreline accessibility and the potential for double-counting were taken into consideration during site selection, with the hopes that one team of volunteers might be able to visit multiple sites in the 4-hour survey window. A survey site can be along rocky intertidal shorelines, a sandy or cobble beach, a small or large bay or an estuary. *For a map of survey sites, please visit [here](#).*

If you live in Puget Sound and would like to participate in this survey this winter, please contact [Adam Sedgley](#), Science Associate at Seattle Audubon. The Science Committee is interested in conducting surveys throughout Puget Sound, especially at Important Bird Areas or other areas of ecological interest.

Recording Data

- Please take the recording form with you into the field. To download, please visit the volunteer Tool Kit: <http://www.seattleaudubon.org/sas/WhatWeDo/Science/CitizenScience/PugetSoundSeabirdSurvey/ResourcesandDownloads.aspx>

Submitting Data

- Data can be submitted ONLINE at http://birdweb.org/Birdweb/seabird_survey/login.aspx.

Data Archival

- After you input your data online, please keep the paper copy of the recording form. Seattle Audubon will archive them after the completion of the survey year.
- Send completed Puget Sound Seabird Survey recording forms by May 1st to:

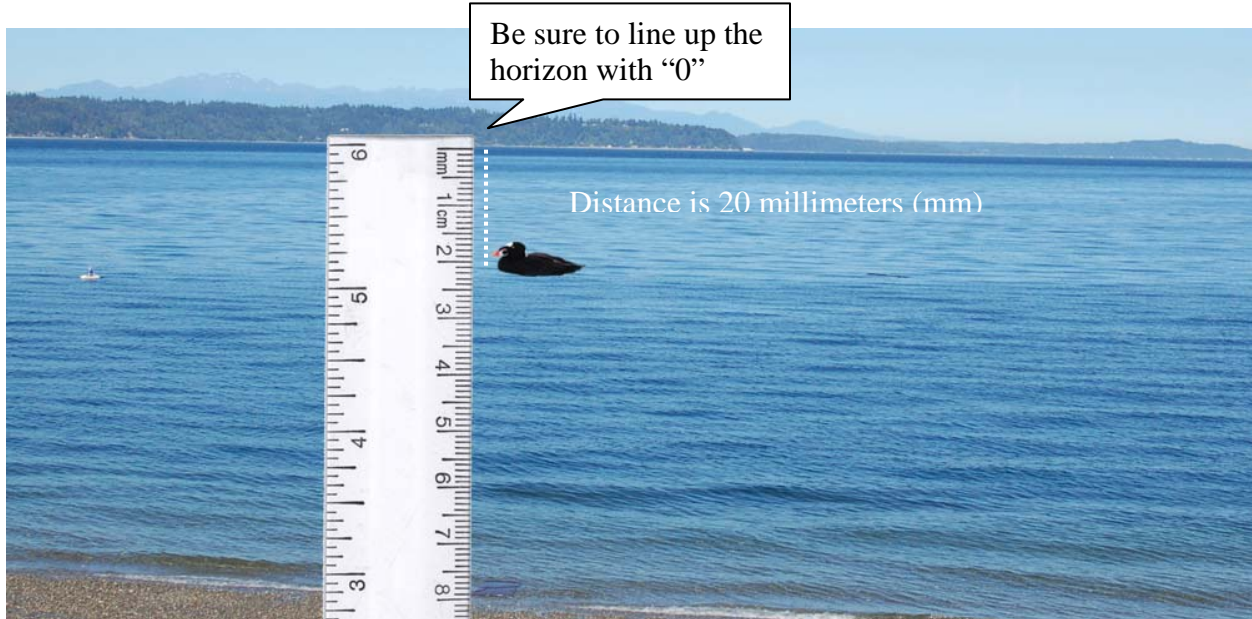
Seattle Audubon
8050 35th Ave NE
Seattle, WA 98115
attn: Puget Sound Seabird Survey

SAFETY

The shoreline can contain dangerous habitats. Please take great care during your survey, especially in inclement weather. Please inform someone when you are counting coastal seabirds and your expected time home. Please wear the appropriate clothing, like warm layers and rain gear when needed. Seattle Audubon cannot accept responsibility or liability for accidents during activities related to the Puget Sound Seabird Survey.

ADDITIONAL RESOURCES:

Measuring distance



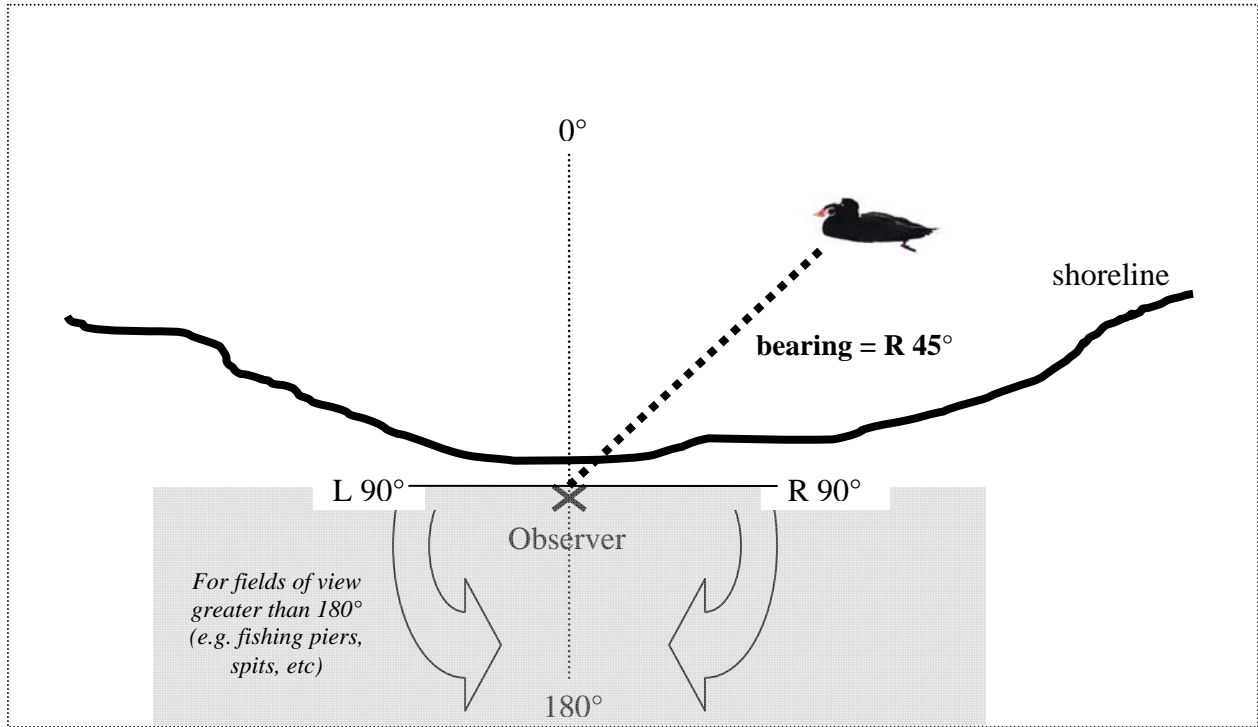
Calculating "bearing"



*PSSS compass (with Velcro strap provided in PSSS Volunteer Packet) can be attached to a spotting scope to accurately measure bearing to a bird. **Please read and record the bearing to which the red needle points.** NOTE: line-up "N" on compass bezel with forwarding pointing arrow and place on a level location on top of the scope. Compass can also be hand-held if surveyors do not use a scope but great care should be used to point the compass directly towards the bird.*

Calculating “bearing”

(using back-up technique when compass is unavailable for survey)



Time Windows for 2009-2010 Survey

Listed below are the times for daylight high tides on the first Saturday of every month during the census. Two hours have been added on either side of each high tide to create the census “window”. Some surveys have been shifted to start 30 minutes after sunrise or end 30 minutes before sunset to ensure optimum viewing conditions. **Please be sure to complete your census(es) within this window.**

			high tide	PSSS census window	sunrise	sunset
October	3	2009	4:58pm	2:14pm – 6:14pm	7:12am	6:44pm
November	7	2009	8:56am	7:33am – 11:33am	7:03am	4:43pm
December	5	2009	7:49am	8:12am – 12:12pm	7:42am	4:18pm
January	2	2010	5:02pm	12:00pm – 4:00pm	7:58am	4:30pm
February	6	2010	9:47am	7:59am – 11:59pm	7:29am	5:18pm
March	6	2010	8:16am	7:10am – 11:10am	6:40am	6:02pm
April	3	2010	7:50am	7:14am – 11:14am	6:44am	7:42pm