

USFWS Bull Trout Radio Telemetry Project Study Plan

Introduction

The U.S. Fish and Wildlife Service (USFWS) plans to radio tag bull trout in the Wenatchee River basin in the year 2000. The purpose of the study is to determine bull trout movements, habitat use, and spawning locations. Adfluvial, fluvial, and resident bull trout life forms exist within the basin. Knowledge of connectivity among the three life forms, migration patterns, habitat use, and spawning locations of the life forms is lacking. We will be evaluating migratory bull trout collected at the Chiwawa River weir, Lake Wenatchee, and from the mainstem Wenatchee River at Tumwater Dam and Dryden Dam using 30 two-year radio tags. In a separate study, the USFWS will be radio-tagging up to 15 bull trout with 6-month tags in Icicle Creek. These bull trout will be collected downstream of the fish barriers at the Leavenworth National Fish Hatchery (NFH) near RM (river mile) 2.8. The Icicle Creek bull trout study is part of a larger effort to evaluate provision of fish passage through Leavenworth NFH grounds which is being evaluated under NEPA. These fish will be released at various locations in Icicle Creek and may move into the Wenatchee River and other tributaries. Information about their movements will add to information from this study.

Goals and Objectives

This is the first study of bull trout movements in the Wenatchee River Basin. Our primary goal is to get general movement and habitat use information. Information on movements of individual fish will be valuable since there is no existing movement information. More effort will be spend ground and aerial tracking during critical periods such as pre-spawning, spawning, and winter to determine exact locations.

Goal: Obtain information on fluvial and adfluvial bull trout movements, habitat use, and spawning locations in the Wenatchee River basin.

Objectives:

1. To document timing and location of spawning activity for adult bull trout in the Wenatchee River Basin.
2. To document late-fall/winter movement patterns and habitat used by adult bull trout from the Wenatchee River Basin.

Application

Results of this work will help identify fluvial/adfluvial migration and habitat use in the Wenatchee River Basin. It will assist in updating the aquatic baselines used in bull trout consultation and add to other databases such as the Washington Department of Fish and Wildlife's Salmonid Stock Assessment. This information will help in making management decisions and conservation recommendations that will minimize adverse effects and aid in bull trout recovery.

Study Area

The study area will include the Wenatchee River and its tributaries. Radio-tagged bull trout may also move into the Columbia River. The tributaries that are known migration corridors or spawning areas for bull trout include: Icicle Creek, Chiwawa River, Chikamin Creek, Rock Creek, Phelps Creek, Nason Creek, Mill Creek, Little Wenatchee River, White River, and Panther Creek. The river mileage of the Wenatchee River and these tributaries up to known spawning areas is approximately 152 miles. Appendix A is a listing of the streams and river mileages in the study area and Appendix B contains maps of the area.

Approach

Field work will involve capturing, radio-tagging, and tracking migratory bull trout. Bull trout will be captured from up to four locations. Ideally we will tag ten fish each from the Chiwawa River, Lake Wenatchee, and the mainstem Wenatchee River sites. All sites are equally important in terms of objectives. If we are not able to capture the full 10 fish from the Wenatchee River or Lake Wenatchee, we will tag additional fish on the Chiwawa River. Temperature and flow information will be collected in cooperation with USFS and USFWS. We will also utilize flow information collected by U.S. Geological Survey.

Capturing Fish

Chiwawa River: Approximately ten fish will be captured at the upriver trap and weir operated by Washington State Department of Fish and Wildlife (WDFW). The trap and weir are operated four days per week from the end of May through the end of August or early September. We will coordinate with the WDFW to tag two to four fish per scheduled tag date. Tagging dates will be spread out to tag fish over several weeks.

Lake Wenatchee: Approximately ten fish will be captured by angling with lures or flies in the lake near the sockeye net pens and at other locations. Captured fish will be netted to bring them onto the boat. Bull trout will be held in large containers and if held longer than five minutes the water will be exchanged or we will use aerators. Once a bull trout is captured, it will be brought to the processing site. We will try to capture and radio-tag 10 fish from the lake.

Tumwater and Dryden Dams: Approximately ten fish will be captured in the fish bypasses at Tumwater and Dryden Dams. The fish capture facilities at Tumwater will be operated by WDFW beginning July 19, and operated three days per week, 16 hours per day. Dryden Dam will be operated beginning July 5. We will coordinate with WDFW to notify us if they capture a bull trout during times we are available to tag the fish. Once contacted we will go to the site to tag the fish as soon as possible. We may not be able to obtain ten fish at these sites because few (12 or so) bull trout are seen at the sites and the traps begin operation after bull trout migration has. We can capture additional fish at the Chiwawa site or possibly from Lake Wenatchee.

Radio-tagging and processing bull trout. Handling and tagging will be carried out by USFWS personnel trained in surgical procedures for fish. The procedure for bull trout will involve: 1) anesthetize the fish using MS-222; 2) remove fin tissue for genetic analysis; 3) measure and weigh the fish; 4) determine the sex of the fish; 5) surgically implant a Lotek radio-tag; 6) allow the fish to recover; 7) transport if needed; and 8) acclimate transported fish for approximately 15

minutes and release. We will complete the data form in Appendix B for each fish that we radio-tag.

Bull trout typically spawn late September through October. There is concern that bull trout captured later in the summer may be expending considerable energy for gonadal development and then migration. We will complete our radio-tagging for this study by August 4, 2000. Previous studies have demonstrated that transmitters implanted or inserted into salmonids had no effect on survival, growth, behavior, and swimming ability (Martin et al. 1995, Peake et al. 1997, Swanberg and Geist 1997, and Young 1996). We will use two types of radio-tags developed by Lotek Engineering: 15 MCFT-3BM (6-month) and 30 MCFT-3A (2-year) radio-tags. Specifications of the tags are as follows:

Coded Microprocessor Transmitters-MCFT Series:

Model	Dimensions Dia. x L (mm)	Weight in Air (g)	Weight in Water (g)	Typical Operational Life (days) (based on 5s Burst Rate)*
MCFT-3BM	11.0 x 43.0	7.7	3.7	238
MCFT-3A	16.0 x 51.0	16.1	6.2	680

A general rule for telemetry studies is that tags not exceed 2% of the fish's body weight (Winter 1983). Minimum fish size for the 2-year tags is 805 g (1.8 pounds). The 30 tags will be on three different channels (9, 10, and 11) and there will be unique code for each tag. The tags have a transmission rate of 1 pulse every 5 seconds.

We will also attach temperature recording archival tags on up to six of the radio-tagged bull trout. The tags are 28 x 16 x 8 mm in size, weigh 4 g, and are made by Conservation Devices, Inc. of Belmont, Massachusetts. Tags will be attached externally alongside the dorsal fin by means of two surgical stainless steel wires or stainless steel pins. We will back the archival tag wires or pins with plastic discs or other appropriate materials to protect against excessive wear and tissue damage. Tags will be attached at the time that we are inserting radio-tags as outlined in our permit application. Additional time under anesthesia should be one minute or less. The 2 year radio-tags weigh 16.1 g and the archival tag weighs 4 g; therefore, minimum size for fish with both the 2-year tags and archival tags is 1005 g (2.22 pounds).

Fish used for radio tagging will be held in flowing water, freshwater, or water with an oxygen supply source if held for over 5 -10 minutes. Fish will be processed individually for radio-tagging. Everyone handling fish or equipment will wash their hands to remove any sunscreens or other substances. The person performing surgery will wash their hands in Nolvason solution before surgery on each fish. Surgical tools will be soaked in a Nolvason antiseptic bath and

rinsed in a 0.1% saline solution. The radio-tag will be thoroughly cleaned of all tape residue. Fish will be placed in a holding tank containing 80 mg/L concentration of tricaine methane sulfonate (MS 222), buffered with 160 mg/L of sodium bicarbonate (baking soda, to neutralize the pH). The fish will be given a number and we will record radio-tag channel and code, date, and time captured and processed. Once anesthetized total length, and weight will be recorded. One or two tissue samples of the caudal fin will be removed and placed with a label in a vial containing 100% ethanol. These samples will be analyzed by one or two genetics laboratories. The fish will be transferred to a surgical table equipped with a V-shaped trough to hold them upright with the ventral side exposed. The trough will be foam lined, we will put Poly Aqua on the foam and wet the foam. Betadine will be used to disinfect the site prior to the incision. A gravity-fed irrigation system with a 15 liter holding capacity or large syringe (turkey baster) will be used to flush the gills with a 40 mg/L concentration of MS-222 buffered with 80 mg/L of sodium bicarbonate, to keep the fish anesthetized during the surgical procedures. Efforts will be made to not get any of the MS-222 into the surgical site. The incision will be to the lateral of the midline and up of the pelvic girdle. The incision will be long enough to accommodate the diameter of the tag. A catheter will be used to make the exit hole for the antennae which will be off to the side of the fish. Three to four knots will be used.

Radio tags will be surgically implanted in the body cavity using methods described in Summerfelt and Smith (1990). Tags will be inserted in the fish through an approximate 2-3 cm incision made laterally of the mid-ventral line and anterior to the pelvic girdle. We will visually look into the incision site to determine the fish's sex. A hollow needle (catheter) will be used to insert the antenna through the body cavity musculature. We will use a lateral antenna exit site and angle the antenna to above and posterior of the pelvic fins. The incision will be sutured using absorbable suturing material (Vicryl 3-0) and 3-4 independent sutures with a 3-2-2 wrap pattern. The surgical needle and thread will be rinsed in the saline solution between each stitch as will other equipment as needed to prevent the introduction of MS-222 or other substances into the wound. An external topical antibiotic (betadine) will be applied after the surgery is complete, then swabbed. A veterinarian's glue (Vetbond) will be used over all sutures and the incision to help bond tissues and keep water out of the incision. We will aim to complete the surgery within 5-7 minutes. After the surgery is complete, the fish will be placed in a fish tote (large PVC pipe with holes closed with wood on the ends with a rope handle) in a large container of oxygenated freshwater. The fish will be transferred to the release site and held in totes until they are able to maintain an upright position and appear to be adequately acclimated to the site. Holding time will be approximately one-hour. At Lake Wenatchee, the fish may be held in a large recovery tub with an oxygen bubbler and released in the lake after 15 minutes.

Transfer and release of bull trout-

Chiwawa Weir:-Fish will be released at a site approximately one-mile upstream of the weir. This is to prevent the adults from becoming impinged on the weir. Fish will be moved in fish totes in tubs of water equipped with an oxygen delivery system. Once at the release site, the fish will be carried in the totes (perforated tubes made out of PVC piping with one removable wooden end and a rope attached for carrying) down to the water (< 1 minute) and held until the fish is recovered and acclimated, approximately one hour. Estimated total time for tagging, transfer, recovery, and release is 1.5-3 hours, depending on how many fish we are processing.

Approximately two to four fish will be tagged per date. Water temperatures will be measured in the bull trout's holding water and at the release site. If necessary, river water will be added to the holding tank to temper the water

Lake Wenatchee:- Fish will be released as near as possible to their capture site or at an appropriate site near the fish processing site. Preferably the site will have some cover - depth, substrate, etc. for the recovering fish. We will have a boat to move fish from their capture site to the processing site and to their release site. The fish will be moved, held, and acclimated in totes. Fish will be held until they are recovered and acclimated enough for release, approximately one hour. Estimated total time after being caught for moving to the tagging site, tagging, transfer, recovery, and release is 1.5 to 2.5 hours, depending on how many fish we are processing.

Tumwater and Dryden Dams:- At Tumwater Dam, fish will be released towards the upper end of the large pool formed by the dam approximately ½ mile upstream. Fish captured at Dryden Dam will be released near the Peshastin Creek confluence into a slow water area. The fish will be moved in totes in tubs of water then carried down to the pool in the totes (< 1 minute). Fish will be held until they are recovered and acclimated, approximately one hour. Estimated total time for tagging, transfer, recovery, and release is 1.5 hours. We may only be tagging one fish at a time at these sites.

Tracking Bull Trout.-

Radio-tagged fish will be monitored using fixed and mobile receivers. There will be ten stationary sites located at sites on the Wenatchee River, Chiwawa River and tributaries, Nason Creek, Little Wenatchee River and White River (Table 1). WDFW will also be using the fixed stations on the Wenatchee River near the mouth of Lake Wenatchee, the Little Wenatchee and White rivers through the fall for a separate sockeye salmon study. We will coordinate with Chelan PUD to obtain information from stationary sites they operate in the Columbia River. Fixed receiver will be operated 24 hours a day. Some sites will not be operated during the winter because of difficult access and difficulty keeping receivers dry. We will remove sites at Chikamin, Rock, and Phelps creeks after bull trout have moved out of those tributaries or snow makes access to the sites difficult. We will also have to remove the site on the Little Wenatchee River during the winter. We will try to maintain the other sites through the winter. We will coordinate with USGS - Biological Research Division, Bioanalysts, and Chelan PUD (Public Utility District) who will assist with loaning equipment, site location, setup, and operation of fixed site locations.

Stream	Site	RM	# Antennas	What monitored
Wenatchee R.	Dryden Dam	17.5	2	up, down
Wenatchee R.	Tumwater Dam	32.7	2	up, down
Chiwawa R.	Hatchery	0.5	2	up, down
Chikamin Cr.	Bridge	0.8	2	up, down
Rock Cr.	Mouth	0.0	4	Chiwawa and Rock up and down
Phelps Cr.	Bridge	0.3	2	up and down
Wenatchee R.	near Lake, Hwy 207 bridge	53.4	2	up, down
Nason Cr.	USFS weigh station	1.5	2	up, down
Little Wenatchee	old weir site	1.0	2	up, down
White R.	bridge	1.5	2	up, down

Mobile receivers will be used to ground track as described in Young (1996) to document distance traveled and the type and location of habitat used for holding and spawning. With the mobile tracker we will locate fish up to two times/week immediately before and during migrations, up to once/week while holding in tributaries, and up to once/month during winter. Radio-tagged fish will be located from a vehicle, walking, and a motor boat for use in Lake Wenatchee. If we detect a signal from a vehicle we will attempt to more precisely determine the fish's position on foot. In coordination with USFS, snowmobiles may be used in the winter to track fish.

Stationary sites will be used to determine what drainages or zones fish are in. These areas will be defined as the area between two stationary sites including tributaries that bull trout are known to use or upstream of stationary sites to known fish barriers. More precise locations of fish will primarily be determined by mobile tracking from vehicles on roads. There are numerous stream miles that we will not be able to track from a vehicle. Some of these reaches can be tracked from hiking trails. Other reaches will require considerable effort to ground track. We will occasionally schedule days to track from hiking trails, off trail, or while walking in the stream. We may be able to raft or use a small boat may be used to track from when fish cannot be located. Locations of bull trout in Lake Wenatchee may be difficult to get because of the large size of the lake and the depth. WDFW will be mobile tracking Lake Wenatchee to locate their sockeye salmon and may locate some of our bull trout. We will coordinate with them to obtain that information. We will aerial track from a helicopter or fixed-wing airplane at selected times.

Prioritized times for aerial tracking are pre-spawning (to determine if fish move up to their spawning areas and wait to spawn or if they hold in other areas until just prior to spawning and then move into spawning streams), during spawning (to determine spawning locations), and in winter to determine winter holding areas. Aerial flights will also be important to identify the

locations of fish that we have not been able to locate while mobile tracking so that we can more effectively track them. We have sufficient funds to conduct up to four helicopter flights or if tracking from a fixed wing airplane is efficient, we can substitute probably up to three or four airplane flights for one helicopter flight.

When we mobile track we will record the information specified in Appendix C. We will also use GPS to determine location coordinates of fish for entry into the U.S. Forest Service and USFWS GIS systems. We will try to locate redds constructed by radio-tagged bull trout and will map their locations using GPS. If we determine the exact location of a bull trout we will record habitat information (e.g., pool or riffle, substrate size, cover type). We will collect habitat information for bull trout that we locate similarly to Swanberg (1991). Diel tracking will be conducted similar to methods described in Bunnell et al. (1998).

Batteries for the mobile and stationary receivers will be checked, charged, and exchanged with fresh batteries as necessary. Data from the stationary sites will probably be downloaded weekly and at least once every three weeks.

Coordination

The USFWS Mid-Columbia River Fishery Resource Office and the Wenatchee Sub-Office will conduct and be involved in all aspects of this project. Tracking fish and the use of stationary sites will be coordinated with WDFW, Chelan County PUD, and Bioanalysts who will also be tracking radio-tagged fish during our study period. Fish collections at Dryden Dam and Tumwater Dam will be coordinated with WDFW. Fish collections at the Chiwawa weir will also be coordinated with WDFW. The U.S. Forest Service will provide temperature and flow data and habitat survey information that they collect. We will coordinate with USFS for stationary site setups and tracking on USFS lands. USFS personnel will assist with tracking. We will be coordinating the study with the U.S. Geological Survey Biological Research Division for training in surgical procedures for fish, stationary site setup assistance, borrowing equipment for stationary sites, and review of study results. Tag channels and codes will be coordinated through the University of Idaho. Permits for all aspects of the study will be obtained from USFWS, NMFS, and WDFW and will be on hand when operating under them.

Products

Products will include at least quarterly progress reports that will be distributed internally and to cooperators to inform them of the status of the study. After winter locations have been determined, we will prepare the first annual report which should be completed spring of 2001. A final report will be completed after tracking is complete in the spring of 2002 and should be complete by the winter of 2002.

Tasks and Activities

Task 1. Radio-tag 30 migratory bull trout with 2-year tags from June through August, 2000 from the Wenatchee River at Dryden and Tumwater dam sites, at the Chiwawa River weir site, and from Lake Wenatchee.

- Activity 1.1. Coordinate field work with WDFW, USFS, Chelan County PUD, USGS - Biological Research Division, Cook, WA, and University of Idaho.
- Activity 1.2. Install fixed receivers with two directional antennas on the Chiwawa River, Chikamin Creek, Rock Creek, Phelps Creek, and Nason Creek. Use fixed receiver sites at Tumwater Dam and Dryden Dam. Coordinate with WDFW to receive information from stationary sites on the Little Wenatchee River, White River, and Wenatchee River near the mouth of Lake Wenatchee. Coordinate with Chelan County PUD to receive information from receiver sites on the Columbia River.
- Activity 1.3. Capture bull trout using various methods, collect information on sex, maturity, and length. Collect fin tissue for genetic analysis, radio-tag, and release.
- Activity 1.4. Compile and present the number of fish radio-tagged by date, size, age, and wild or hatchery origin.

Task 2. Monitor the movements of radio-tagged fish. Fish will be tracked for up to 2 years, depending on the life of the tag. Tracking is expected to end sometime during the spring of the year 2002.

- Activity 2.1. Monitor the movements of radio-tagged bull trout year-long using fixed receivers. Locations and duration of use of the fixed sites will be dependent on availability of receivers and accessibility of the sites.
- Activity 2.2. Monitor the movement of radio-tagged fish using a mobile receiver during spawning and winter holding periods to determine exact locations. Use mobile tracking at other times when time allows from locations along the road.
- Activity 2.3. Determine the locations of radio-tagged fish using aerial surveys at selected times: pre-spawning, spawning, and winter.

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Task 3. Annually summarize the movements and spawning distribution of radio-tagged bull trout.

Activity 3.1. Graphically present movement information for each radio-tagged fish. Use a 7.5 minute map and/or GPS (geographical positioning system) to locate exact positions where fish are found.

Activity 3.2. Determine the spawning location of individual fish. The spawning location of radio-tagged fish will be defined as the last location (river, and river kilometer) a fish remains near an active spawning site for at least five days. Use 7.5 minute quad map or GPS to locate exact positions. Measure dimensions of redds at times when spawning fish will not be disturbed.

Activity 3.3. Summarize the spawning distribution of fish by category (capture site and date, fluvial or migratory).

Task 4. Evaluate how fish movements are related to habitat parameters.

Activity 4.1. Determine a range of temperatures when fish are migrating and spawning using USFS, WDFW data, and other sources.

Activity 4.2. Determine a range of flows when fish are migrating and spawning using USGS, USFS, WDFW data or other sources.

Activity 10. Prepare regular reports to summarize study information.

Activity 10.1 Prepare annual reports for 2000, 2001, 2002 and a final report summarize study findings. Include analyses of movements.

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Appendix A. River mile locations and stationary receiver sites** in the Wenatchee River Watershed

<u>River</u>	<u>Mile</u>	<u>Description</u>	<u>Water Elev.</u>
<u>Location</u>			<u>Ft.</u>
0.01		Mouth of Wenatchee River at river mile 468.4 on Columbia River	612
10.5		Mission Creek	766
16.2		Streamgage, USGS #4610	902
17.5	**	Dryden Dam Site	967
17.9		Peshastin Creek	967
21.5		Streamgage, USGS #4590	1,032
23.5		Chumstick Creek	1,068
25.6		Icicle Creek	1,102
32.7	**	Tumwater Dam Site	
35.6		U.S. Hwy 2 Bridge	
35.9		Chiwaukum Creek	1,666
46.2		Plain Road Bridge at PLAIN	
46.2		Streamgage, USGS #4570	1,805
48.4		Chiwawa River (Index 30.2-33.1)	1,850
	**	0.5 Chiwawa State Hatchery and weir site	
		13.8 Chikamin Creek (Index rm 0.8-5.4)	
	**	0.8 Chikamin Creek bridge	
	**	21.3 Rock Creek (Index rm 0.6-5.3)	
	**	0.0 Rock Creek mouth	
		30.2 Phelps Creek (Index rm 0.3-2.1)	
	**	0.3 Phelps Creek bridge	
		30.3 Streamgage, USGS #4560	
		30.3 end of road	
53.4	**	Highway 207 bridge	
53.6		Nason Creek (Index rm 20.5-21.7)	1,869
	**	1.5 USFS Weighing Station	
		20.5 Mill Creek (Index rm 0-1.2)	
54.1		Streamgage, USGS #4550	1,872
54.2		Outlet of Lake Wenatchee	
57.2		Streamgage, USGS #4545, on north lake shore	
58.6		Head of Lake Wenatchee	
		Little Wenatchee	
		7.8 potential barrier falls	
		White River	
		11.0 Napeequa River	
		13.1 Panther Creek (Index rm 0-0.7)	

Radio-Tagging by Surgical Implant Data Sheet

Bull Trout #	
Date and Time	
Site Location	
Capture Method	
Approx Time Captured	

Transmitter Frequency		Surgeon	
Transmitter Code		Anesthesiologist	
Transmitter Size		Assistant	
Water Temp.		Air Temp.	
Weather/Conditions/Shade			
Genetic Sample Info			
Fish Weight			
Fish Length (total)			
Sex and Maturity	Male Female		

Time into Anesthetic bucket Concentration (80 mg/L)	
Time Out of Bucket	
Time Begin Surgery Concentration (40 mg/L)	
Time End Surgery	
Total Surgery Time	
Total Anesthesia Time	
Number of Stitches & Type of Knot	
Suture Material	

Comments:

Transfer Method	
Time Transfer Begins	
Time Transfer Ends	
Acclimation Time	
Release Time	
Condition of Fish	

Comments:

Surgical Checklist:

- Permits - USFWS, WDFW - on site
- MS-222 concentrations correct (80 mg/L in bucket 40 mg/L during surgery)
- Poly Aqua on cradle (1 t./ 45 L)
- Nolvason and saline sol'n for tools (15 ml Nolvason/500 ml distilled water, 1 t. salt/500ml)
- Surgeon wash hands with Nolvason before every surgery (15 ml Nolvason/500 ml water)
- Others wash hands to cleanse of sunscreens etc. before handling eqpt.fish etc.
- Swab betadine on fish before incision
- Keep suturing material out of MS-222, rinse in saline solution if needed
- Change needle every 2-3 fish
- Keep MS-222 out of incision site
- Use sterile gauze pads to clean blood, solutions
- Apply betadine, swab fish, then apply Nexaband to sutures and incision
- Change tool sol'ns every fish or every other fish
- Tools cleaned in between fish
- blades changed every 1-2 fish
- fish held in totes in oxygenated water
- monitor temperatures
- shading
- handle fish carefully

Draft 9-7-00

Appendix C

Radio Tracking Data Recording Checklist (record info into field book)

** Need permits on hand if snorkeling, retrieving archival tags, and ground tracking next to stream

Daily Information

Date

Who tracking

How

Route

Photographs

Number, location, what

Fish Located

Location description

GPS location

where GPS recorded (vehicle, LB, RB)

Map location - mark on map, note river mile and T R S

Location precision (from road to visual)

Stationary Sites

Name

data checked, downloaded

battery checked, changed

Notes about what needs to be done to service sites

zones where fish are located, where to track

Daily Summary

route followed

Number of sites checked

Number of fish located

Recommendations for next tracking days

Comments

(Copy data book after every day used)