NORTH CAROLINA DIVISION OF MARINE FISHERIES

Diving Safety Manual

Diving Control Board

Revised March 23, 2023
Edits completed by NH, BP
Edits voted on by DCB members March 20, 2023

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Section 1

Scientific Diving

General Policy

The Division of Marine Fisheries (DMF) periodically performs underwater monitoring, sampling, and investigation of habitat sites and materials utilizing SCUBA. Because of inherent risks associated with scientific diving, this Diving Safety Manual has been prepared. Adherence to established diving procedures and policies, as set forth in this manual will enhance the overall safety level of DMF personnel. Individuals should have a thorough understanding of the procedures, policy, and regulations described in this manual.

The Diving Safety Manual (DSM)

The purpose of the Diving Safety Manual is to set forth the basic diving safety policy, organization, regulations, and procedures for safety in diving operations. This manual will cover all diving operations specific to the DMF Scientific Diving Program (SDP), including criteria for diver training and certification and procedures for emergency care.

Scientific Diving Defined

Scientific diving is defined as all diving by employees, for the sole purpose of performing scientific research tasks in conjunction with the SDP. This will include DMF dive operations necessary for scientific research or as part of an educational activity.

NCDMF Scientific Diving Program, Auspices Defined

For the purposes of the policies, procedures, and regulations set forth in this manual, the auspices of the SDP include: any scientific diving operations in which the DMF is connected, of any equipment or vessel used, locations selected, and relationship with the individuals concerned. This includes all cases involving the operations of employees of the DMF or employees of auxiliary organizations where such employees are acting within the scope of their employment, and the operations of other persons who are engaged in scientific diving for the DMF.

Liability

1. It is the diver's privilege and duty to refuse to dive at any time, if, in the diver's judgment, conditions are unfavorable or unsafe, or if by diving he/she would violate his training or these policies and procedures.
2. Prior to engaging in scientific diving activities for the SDP, the diver must understand and agree in writing to abide by the policies and procedures as set forth in this manual (Appendix A).

3. In adopting the policies and procedures set forth in this manual, DMF is liable for all injuries and illnesses as provided by the State Workmen's Compensation Act, (G.S. –97).

Section

2

Organization

The Diving Control Board (DCB)

The purpose of the diving-control board shall be to approve and monitor diving projects, review and revise, assure compliance with the Dive Safety Manual (DSM); certify the scientific divers; recommend disciplinary action for unsafe practices to the Deputy Director; and assure adherence to the buddy system for SCUBA diving.

Policy Administration

The DCB has autonomous authority for the administration of the DMF Scientific Diving Program and all scientific diving activities. Meetings can be convened if the majority of the DCB members are available. Minimal number of meetings will be twice a year. There will be a chairman and a co-chairman.

1. The Diving Control Board (DCB) shall consist of at least 51% active scientific divers.
2. The DCB shall inform the Deputy Director and any concerned section chiefs of all diving activities, changes in procedures, diving problems, diving accidents, and disciplinary actions.
3. The DCB shall act as a Board of Appeal to consider diver-related problems.
4. The DCB shall have the authority to issue, reissue, or revoke certification of divers participating in the DMF scientific diving program. Disciplinary actions by the DCB include suspension or revocation of scientific diver certification. If further disciplinary actions are justified, the DCB will make recommendations to the Deputy Director who will follow normal department procedures for such actions.
5. The DCB shall review the Diving Safety Manual at least annually and shall implement changes as needed.
6. The DCB shall, when given just cause, suspend diving operations that it considers to be unsafe, unwise, or ill planned.
7. The DCB shall sit as a Board of Investigation to inquire into the nature and cause of diving accidents or violations of the policies or procedures in the DMF Diving Safety Manual.

Dive Control Board Members

Michael Loeffler- Administration Officer (non-diver)
Nick Hendrix – Dive Safety Officer
Bennet Paradis – Co-Chair
Mason Ellis – Co-Chair
Jason Peters
Jordan Byrum
Brad Berry
Abby Williams
Sam Pierce
Doug Munroe
Trent Kennedy (Non-diver)

The Diving Safety Officer

Qualifications

1. A DSO may be appointed to a particular diving project.
2. The responsible administrative officer or his/her designee, with the advice and counsel of the DCB, shall appoint a DSO any time the DCB deems it necessary.
3. The DSO must be a NCDMF employee and an active scientific diver with the Division of Marine Fisheries Diving Program.
4. The DSO serves as a member of the DCB. This person should have research expertise and experience with all DCB diving research.
5. Shall be trained as a scientific diver.

Duties and Responsibilities

1. Shall be responsible, through the DCB, to the responsible administrative officer or his/her designee, for the conduct of the particular diving project. The routine operational authority for this program, including the conduct of training and certification, approval of dive plans, maintenance of diving records and ensuring compliance with this manual and all relevant regulations rests with the DSO.
2. May permit portions of this diving project to be carried out by a qualified delegate, although the DSO may not delegate responsibility for the safe conduct of the local diving project.
3. Shall be guided in the performance of the required duties by the advice of the DCB, but operational responsibility for the DSO will retain the conduct of the local diving project.
4. Shall suspend diving operations, which he/she considers to be unsafe or unwise.

Dive Supervisor (DS)

One individual will be designated by the project leader as the DS for each dive conducted. This person shall remain at the dive site for the duration of the scientific dive or dives. This position is typically a member of the deck support crew or the captain of the vessel. The DS shall be responsible for:

1. Ensuring that it is safe to put divers in or bring divers out of the water. This includes close coordination with the vessel captain and Lead Diver prior to, during, and at the conclusion of these activities.
2. Ensuring that an accurate running time for the dive and ensuring that the total bottom time for the dive, as well as other related information is properly recorded in the diving log.
3. Initiating last minute check of all divers in the pair/group before signaling for them to leave the surface.
4. Recording all incidents and terminating dive operations if conditions or incidents dictate
5. SDIT are not to be considered for Dive Supervisor responsibilities.

Lead Diver (LD)

The LD shall be appointed by the diving group. The LD shall be responsible for the following:

1. Ensuring that the divers are properly briefed and prepared in all respects prior to beginning each dive.
2. Assessing the dive conditions; monitoring visibility, temperature, current and any possible unforeseen hazards.
3. Monitoring the condition of each of the divers.
4. Closely monitoring bottom time, depth, and air supply.
5. Terminating the dive as planned or, if the need arises, aborting the dive.
6. SDIT are not to be considered for Lead Diver responsibilities.

Administrative Requirements

Record Maintenance

Either Co-chair shall oversee permanent records for each individual diver. The OS Technician II (or other appointed individual, if position is vacant) shall manage record keeping and shall manage the updating of all files. The file shall include documentation of SCUBA certifications, diving log (Appendix G and working Excel file), results of a current diving fitness medical evaluation (Appendix C), a signed agreement by the diver to abide by the diving policies and procedures of the DMF (Appendix A), and other pertinent information deemed necessary.

Retention of Records

1. Physician's written report of medical examination (Appendix C) for divers – held by the DCB chairman for a period of 5 years.
2. Dive Logs – Paper and Excel
3. Equipment Inspection and Maintenance Records held by the chairman or his designee until equipment is withdrawn from service.
4. The current Diving Safety Manual will be kept by the Deputy Director, DCB members, and every active diver.

Board of Investigation Procedures

A diving certificate may be revoked or restricted for cause by the Diving Safety Officer or the DCB. Violations of regulations set forth in this manual, or other governmental subdivisions not in conflict with this standard, may be considered cause.

1. Dive Incident Reports will be filled out by Dive Supervisor at the completion of every dive operation and deliver to any DCB member.
   a. Dive Incident Form is located on the back of the Dive Plan (Appendix P).
   b. Successful dives without incident are to be recorded as such.
   c. Any incident, regardless of severity, shall be recorded on the incident form.
   d. Appendix D with completed Dive Incident Report (Appendix P) will be delivered to a DCB member for review no later than <u>5 business days</u> of the dive operation
      i. ***The DCB shall be notified of all dive incidents <u>immediately</u> upon arrival onshore

2. The Report will be referred to the Co-Chairmen for distribution to DCB for review.

3. The DCB will discuss and decide on appropriate action.

4. The Diving Safety Officer or DCB shall inform the diver in writing of the reason(s) for discipline.

5. The diver will be given the opportunity to present their case in writing for reconsideration and/or re-certification.

6. All such written statements and requests, as identified in this section, are formal documents, which will become part of the diver's file.

Section

3

Diver Certification

General Policy

No person shall participate in DMF scientific diving operations under the auspices of the DMF until that person is currently qualified as a scientific diver pursuant to provisions in this manual. Scientific diving shall not be conducted unless procedures have been established for emergency evacuation of the diver to a hyperbaric chamber or appropriate medical facility. A current copy of the DMF's Diving Safety Manual shall be present at each dive location.

Sites

The regulations herein shall be observed at all locations where DMF scientific diving is conducted.

Diver Eligibility

No person shall engage in scientific diving activities under the auspices of the SDP without receipt of certification by the Diving Control Board (DCB). Diver eligibility requirements apply to Scientific Divers, Scientific Divers in Training, and Temporary Scientific Divers. Minimum criteria for eligibility for unrestricted DMF diving certification shall include:

1. Signed understanding of the DMF Diving Safety Manual, and agreement to abide by the diving policies and procedures in this manual (Appendix A).
2. Application to the DCB for approval to participate in scientific diving activities for the DMF (Appendix B).
3. Written certification by a licensed physician stating that the applicant is medically qualified for diving (Appendix C).
4. Proof of SCUBA diver certification issued by a nationally recognized SCUBA diving certification organization.
5. In the case of persons not employed by DMF, a signed DMF waiver form (Appendix H).
6. Final approval by the Diving Control Board: Based on review of the completion of criteria 1 through 5 above.
7. Applicant must have at least five dives logged, with each dive being at least 20 minutes in durations and to a depth of a least 30 feet ($\geq$20 min@$\geq$30 ft).

Dive Safety Training

Annual dive safety training is required by all DMF Scientific Divers and Scientific Divers in Training. Focus of the training will be to refresh those skills that pertain to diving operations. This will be administered by a DCB approved trainer. Failure to complete approved annual training skills will result in suspension from active diver status until skills are completed. These skills may include, but are not limited to:

1. Swimming proficiency skills
2. Practice of rescue skills in the event of a diving related accident during DMF operations.
3. Testing of new equipment and the ability of divers to be checked out on new equipment.
4. Refresher skills for inactive and active divers.

Medical Examination

Requirements

1. All divers participating in the DMF scientific diving program shall have an initial medical examination, approved for diving, prior to engaging in **any** DMF scientific diving activities.
2. Divers participating in the DMF scientific diving program shall also be required to have a medical examination approved for diving every 3 years for divers age forty or younger and every two years for divers over forty after completion of the initial examination to maintain DMF scientific diving certification.
3. After each illness or injury requiring hospitalization of more than 24 hours or after any treatment of a diving related injury or illness, previously qualified divers shall provide documentation of a medical interview or examination which approves the diver for continuation of diving activities.

Documentation

1. Documentation of initial and subsequent diving medical evaluations (Appendix C) shall be provided to the Diving Control Board upon application for approval to participate in DMF scientific diving activities, and to continue activities under DMF auspices. Copies of the actual medical examination are not required.
2. Documentation of initial and subsequent medical evaluations (Appendix C) shall be kept in a permanent file by the DCB for at least five years.
3. All such documentation shall be maintained in strict confidentiality.

Scientific Diving Certifications

Divers issued a DMF Scientific Diver certification may participate in all phases of any scientific diving operations conducted under the auspices of the SDP unless special restrictions are deemed necessary by the DCB. Applicants wanting to participate in scientific diving activities under the auspices of the SDP must meet all applicable requirements set forth in the Diver Eligibility section of this manual. The DCB will review the information provided.

Temporary DMF Scientific Diver

A temporary certification for DMF employees or non-employees to participate in scientific diving activities may be granted by the DCB if the diver meets the following requirements:

1. One of two DCB co-chairs determines the requested diver can contribute significantly to a specific planned dive mission.
2. Items in the Diver Eligibility section have been completed and submitted to the DCB, or otherwise fulfilled by documented reciprocity with another organization (see Reciprocity).
3. If a non-DMF employee, the diver completes the Non-Employee Diver Waiver Form (Appendix H).

4. The diver provides records of logged dives with at least two dives in the last three years that were ≥20 min and ≥ 30 ft. each.
5. The diver provides proof of current oxygen administration and first aid training.
6. Items 1-5 in this section are documented in Appendix N and maintained by one DCB co-chair.

Temporary divers shall be limited to a 60-foot depth certification for all DMF diving operations. The DCB reserves the right to limit dive activities for any individual.

Scientific Diver in Training:

1. All applicants who wish to be trained as a Scientific Diver for DMF must first undergo Scientific Diver in Training.
    a. First aid, CPR, and oxygen administration certifications (from a nationally recognized agency) must be obtained within six weeks of introduction into Scientific Diver Training.
    b. Failure to obtain these certifications within six weeks of introduction into Scientific Diver Training will result in suspension of diving privileges until certification requirements are met.
2. All applicants must undergo Dive Safety Training
3. Divers issued a Scientific Diver-in-Training certification may participate in scientific diving operations conducted under the auspices of the SDP, with the requirement that all of their dives be conducted with two Divers who hold the Scientific Diver certification.
4. As a Scientific Diver in Training, completion of open water dives as described below. All dives shall be under the direct supervision of a minimum of two DMF Certified Scientific Divers. SDIT certifications are split into an inshore certification and an offshore certification as described below:
    a. Inshore SDIT
        i. 100 cumulative minutes of diving with no less than 10 dives to be completed within a 365 day period
        ii. 100 cumulative minutes split into 50 minutes non-working dives followed by 50 minutes observed working dives
    b. Offshore SDIT
        i. Five dives ≥ 20 minutes ≤ 60'
        ii. Two non-working dives, three observed working dives
5. Certified divers accompanying the SDIT during Artificial Reef and Oyster Sanctuary work will be designated as one lead diver and one supervising diver. The supervising diver is assigned to the SDIT. It is the responsibility of this diver to maintain constant visual or be in direct contact with the SDIT for the entirety of the dive. The lead diver will perform the objective of the dive, while also maintaining visual of both the SDIT and supervising diver.
6. Non-working (observation) & Working dives:
    a. When conducting non-working dives as an SDIT, the trainee must not be responsible for carrying any equipment at any time and should have both hands free for the entirety of the dive (except for holding on to another diver, following a buoy line, or anchoring themselves).
    b. During working dives, the SDIT may assist the lead diver by carrying equipment, performing material excavations, or collecting data while under the close supervision of a certified DMF diver. The supervising diver should maintain constant visual or be in direct contact with the SDIT for the entirety of the dive.
7. If an individual fails to become a fully accredited DMF Scientific Diver in nine months from the date of induction, their Scientific Diver in Training status will be re-evaluated and may or may not be reissued at the discretion of the DCB.

Scientific Diver

The Diving Control Board may grant applicants a Scientific Diver certification if the following criteria are met:

1. The applicant successfully completes Scientific Diver in Training.
2. The applicant still satisfies all items in the Diver Eligibility section of this manual (e.g. all training and medical evaluations are current).

Scientific Nitrox Diver
Any diver participating in DMF SDP that is diving under the auspices of a member organization is eligible for authorization to use Nitrox. Proof of Nitrox (enriched air) certification issued by a nationally recognized Nitrox diving certification organization must be presented to the DCB. At that time the DCB may authorize an applicant to use Nitrox within his/her depth authorization

Depth Certification

After the successful completion of the diver's SDIT dives the individual can then move to the depth limit defined by their most advanced certification from a nationally recognized certification agency; the absolute limit of all diving operations under DMF is a depth of 115 feet.

Diver Proficiency Requirements

To maintain certification, each Scientific Diver or Scientific Diver-in-Training must adhere to the following:

1. All SDIT and active divers must maintain current Cardio Pulmonary Resuscitation (CPR), First Aid, and Oxygen Administration certifications. Diving Accident Management procedures should be reviewed annually.
2. All SDIT and active divers must meet the diving medical examination requirements in the Medical Examination section of this manual and Appendix C.
3. All SDIT and active divers must attend annual Dive Safety Training day and pass requisite swim tests administered by the DCB within each calendar year.
4. All active DMF Scientific Divers must log a minimum of one open water dive with DMF (inshore or offshore) during any 12-month period.
    a. Failure to log one dive with DMF during a 12-month period will result in a temporary probationary period in which the diver must complete at least one working dive (inshore or offshore) while being observed by at least two DMF scientific divers and then be approved by majority vote of the DCB to be reinstated as a DMF scientific diver. Failure to log one DMF scientific dive within a 24-month period will result in DMF Scientific Diver status being revoked. The member would then need to go through SDIT training again.

Term of Diving Certifications:

Scientific Divers:
The Scientific Diver certification shall expire one year from the date of the last dive safety training completed by the individual. Re-instatement of 60 Foot Depth Certification may be granted after the diver:

1. Successfully completes Dive Safety Training,
2. Provides proof of recent dives or participation in DMF proficiency dives
    a. One dive within the previous year under any auspices.
3. Satisfactory completion of Diver Eligibility items.

Temporary Scientific Divers:
The Temporary Scientific Diver certification shall automatically expire at the termination of the diving activities for which they were issued.

Reciprocity

The qualifications of a scientific diver currently approved to dive under the auspices of an organization which has adopted standards for scientific diving, (Example AAUS), shall be recognized by the DMF and the DCB,

provided these standards meet or exceed those set forth in this manual. A folder will be kept for each visiting diver.

Advanced Diver Evaluation

There are some Artificial Reefs with depths that exceed 70 feet. In order to perform any working dives between 70 and 115 feet (the limits of DMF Scientific Diving), the DCB requires that divers have appropriate training (i.e., Deep Dive specialty course) and an advanced certification from an accredited SCUBA institution. These credentials

Section

4

Diving Procedures

General Policy

All divers acting under the auspices of the NCDMF SDP shall adhere to the diving rules, regulations and procedures listed herein. Under circumstances not described in this manual, it is the responsibility of the diver and dive team to act in their best judgment to maintain the highest degree of safety and avoid hazardous situations when possible.

Buddy System

All DMF scientific diving shall be planned and executed in such a manner as to ensure that every diver involved maintains effective communication with at least one comparably equipped qualified scientific diver in the water. This buddy system is based on mutual assistance, especially in the case of an emergency. Appendix L has common hand signals used by the DMF scientific divers. This is merely a guide; each dive unit can develop their own signals. Dives should be planned around the competency of the least experienced diver. If loss of effective communication occurs within a buddy team, all divers shall surface and re-establish contact. Deviation from these procedures may be allowed in the case of an emergency.

Diver's Flags

A diver's flag (International Code ALPHA) shall be displayed prominently along with the accepted sport diving flag, (red with white diagonal), while diving operations are being conducted.

Dive Plans

Before conducting any diving operations under the auspices of the DMF, the Project Leader should consider the following information when developing a working dive plan:

a. All divers involved, their level of experience and qualifications.
b. Approximate number of proposed dives.
c. Location(s) of proposed dive(s)
d. Estimated depth and bottom time anticipated
e. Expected environmental conditions
f. Proposed work, equipment and boats needed and details of potentially hazardous conditions anticipated
g. Location of nearest recompression chamber, and emergency evacuation procedures.

1. A DCB board member must approve dive plans before any scientific diving operation begins. A participating member of the dive team may not grant approval of the dive plan. (Appendix D may be used as a standard format for a dive plan).
2. When a Division of Marine Fisheries research vessel is being used as a dive platform, a copy of the proposed plan should be forwarded to the vessel captain concerned. Vessel captains should

coordinate closely with the Project Leader in advance to ensure that all aspects of the plan are understood.

Diver Deployment and Recovery:

1. The Dive Supervisor shall, in cooperation with the vessel captain, (if applicable), determine the safest and most efficient means to deploy and recover dive teams. The method used will be based on such factors as:
    - **a.** The ability of the least experienced diver
    - **b.** Sea state and currents
    - **c.** Surface visibility
    - **d.** Maneuverability of the vessel
    - **e.** Needs of the mission
    - **f.** Use of special equipment
    - **g.** Overall condition of divers and vessel operator
2. All diving operations should be concluded in sufficient time to ensure that adequate daylight remains for the recovery of all divers in the water.
3. In all diving operations a minimum 50-foot safety line attached to an approved USCG Type IV PFD must be available for use in diver recovery operations.
4. A safety line with a minimum length of 50 feet with float must be streamed behind an anchored boat during offshore diving operations.
5. A qualified boat operator must remain in the boat at all times during diving operations. The boat operator or another individual, (certified in CPR/First Aid Training, DAN O2 Administration and been present for dive safety training) must remain on the vessel during diving operations.

Depth and Bottom Time Limitations

1. Dives shall be planned and executed based upon the experience and certification/license of the least qualified diver.
2. All scientific SCUBA diving operations under the auspices of the DMF shall be limited to **no-decompression dives only**. All dives, especially repetitive dives, must be carefully planned to ensure that bottom times do not exceed no-decompression limits, whether using tables or dive computers.
3. All SCUBA diving operations under the auspices of the DMF will be limited to an absolute limit of 115feet.
4. At least one set of dive tables must be present at every dive location. These tables must be at least as conservative as the current NAUI and PADI air dive tables. Each diver will be responsible for ensuring his own safety by computing his own safe no-decompression limits for each dive performed.
5. Multi-level dive computers may be utilized if desired. Multi-level dive computers are to be used for no-decompression dives only. Since dive limits displayed by the computers are just that**, limits**, divers should adjust their bottom times to remain well within these times. Care should be taken to stay within prescribe ascent rates. When using dive computers each diver must abide by the limits of his own computer. Two divers may not use the same computer.
6. Topside personnel designated by vessel captain or dive supervisor will record accurate depth and bottom time information for each dive conducted in the SDP dive log.

Termination of Dive

It is the responsibility of any diver to terminate the dive, without fear of penalty, whenever he feels it is unsafe to continue to dive. The dive shall be terminated while there is still sufficient tank pressure to permit

the diver to perform a three-minute safety stop at 15 to 20 feet and safely reach the surface and inflate his BCD using his auto-inflator. Safety stop times shall be taken into account. Divers should not exceed the assent rate of 30 feet per minute. For example, dive plan for a 60' dive for 20 minutes would be 15 minutes diving, two minute ascension from 60', and a three minute safety stop at 15-20'.A minimum of **500 psi** shall be maintained upon returning to dive platform.

Post-Dive Safety Checks

After completion of a dive, each diver shall report any physical problems, symptoms of decompression sickness or equipment malfunctions to the DS or diving project leader.
Following all diving activities, divers should remain in the near vicinity of another dive team member or the DS for a minimum of 15 minutes. Divers should also remain awake for at least one hour following all dives.

Other Diving Circumstances

Nitrox Diving
The following guidelines address the use of Nitrox by scientific divers under the auspices of DMF SDP. Nitrox is defined for these guidelines as breathing mixtures composed predominately of nitrogen and oxygen, most commonly produced by the addition of oxygen or the removal of nitrogen from air.

1. On any dive during which any team member will use Nitrox, the Lead Diver should be authorized to use Nitrox, and hold appropriate authorizations required for the dive. Nitrox dive computer users should demonstrate a clear understanding of the display, operations, and manipulation of the unit being used for Nitrox diving prior to using the computer.
2. No diver using Nitrox shall use a mixture which contains greater than 36% oxygen.
3. An oxygen analyzer is required which is capable of determining the oxygen content in the scuba cylinder. Two analyzers are recommended to reduce the likelihood of errors due to a faulty analyzer. The analyzer should be capable of reading a scale of 0 to 100% oxygen, within (one) 1% accuracy.
4. Dives shall be planned as not to exceed a Partial Pressure of Oxygen (PO_2) of 1.4 on any one dive nor cumulative for the day
5. All diver and support equipment should be suitable for the FO_2 being used.

Enclosed or Confined Spaces and Night Diving
Confined space diving is not permitted. Night diving shall only be permitted when absolutely necessary, must have due cause, and must be reviewed and approved by the DCB.

Live Boating

Definition: Any time when divers are in the water and an adequately crewed boat is not anchored and in "free float" but is readily available to be mobile and provide support during dive operations.

Live boating is an option for dive operations during short, in-shore observational dives when divers are expected to surface within 10 minutes. The purpose of live boating is to improve time efficiency of observational dives to avoid repeated anchoring without compromising safety of divers in the water.

Live boating requires exceptional boat handling, close quarters maneuvering, situational awareness, and excellent communication skills. All normal procedures and guidelines for diving and safety outlined by the DMF Dive Manual are to be adhered to while live boating.

To enact this procedure, both divers and boat crew must all verbally agree and be comfortable with following the guidelines described below. If anyone believes that live boating would be unsafe or deems it unnecessary – before or during the event– then the crew must adhere to anchoring the boat while divers are investigating a site.

To conduct live boating safely and properly, the following conditions must be met:

1. Weather conditions: good visibility on the water, limited current, and the swell must not exceed 2 feet.
2. At least two divers need to be in the water.
3. The objective of the dive should not include retrieving any material or submerged objects.
4. A highflyer with a dive flag must be deployed to mark that there are divers in the water.
5. At least two people must be present on the boat—a captain, and a mate, one of which must be a certified scientific diver with their gear assembled and ready in the event of emergency.
6. Engines must not be engaged within 50ft of divers.
7. The movement of the boat – engaging the propellers—may be necessary as deemed by the captain in certain circumstances, including but not limited to:
    a. To maintain position within a reasonable distance of the divers.
    b. To maintain a favorable position within the seas.
    c. To gain a better vantage point for tracking the divers.
    d. To reposition the boat near the divers in case of approaching boat traffic.
8. Boat crew must be able to always maintain visual on divers' bubble streams/location.
9. The boat must have a buoy attached to a line, which it will tow behind while retrieving divers.
10. No other vessels are in the vicinity.

Section

5

Diving Equipment

General Policy

All diving equipment, regardless of ownership, used by personnel engaged in scientific diving operations under DMF auspices shall conform to the standards set forth in this manual.

1. Scientific diving conducted under the auspices of the DMF will be restricted to the use of open-circuit SCUBA equipment. The DCB must approve any exceptions to this in writing.
2. It is the responsibility of the diver to properly maintain (i.e. inspect, wash, lubricate) any dive equipment assigned to them for their use.
3. All divers shall report the malfunction or loss of any equipment to the DCB Chairman or Co-chairman or immediate supervisor as soon as possible.
4. Each program/project will ensure that dive equipment under their cognizance is properly maintained and serviced on a regularly scheduled basis (see equipment requirements below).

Equipment Requirements

Minimum Requirements

1. Each diver will be equipped with a minimum of the following: mask, fins, regulator with octopus, tank, BCD, depth gauge, submersible tank pressure gauge, compass, timing device, knife and weight belt.
2. Diving equipment such as a wet suit, snorkel, compass, lights and other additional equipment may be used, as needs dictate.
3. Due to the importance of the timely administration of oxygen in the treatment of many diving related illnesses, each program/project will maintain a portable medicinal oxygen supply at each dive site. The emergency oxygen equipment used must be capable of delivering oxygen to the victim at a rate of 6.0 liters per minute for at least one half hour.

Regulators

1. All SCUBA regulators used will be of the single hose two-stage demand design. Each must have a minimum of one high-pressure port and two additional low-pressure ports in the first stage for hookup of a tank pressure gauge and BCD pressure inflator.
2. Regulators will be inspected and tested prior to each use.
3. Examination/overhaul must be accomplished by a certified regulator mechanic at least once each year.
4. The use of a regulator with an additional second stage or octopus for buddy breathing is mandatory unless a redundant or independent system is used.

SCUBA Tanks

1. SCUBA tanks may be of either aluminum or steel designs.
2. SCUBA tanks must be hydrostatically tested in accordance with D.O.T. standards at a minimum of every five years.
3. SCUBA tanks must have an internal visual inspection at intervals not to exceed one year.
4. Any Scuba tank containing Nitrox mixtures should have the following identification affixed to the cylinder: "NITROX", or "EANx", or "Enriched Air". Nitrox identification color-coding should include a 4-inch wide green band around the cylinder, starting immediately below the shoulder curvature. If the cylinder is not yellow, the green band should be bordered above and below by a 1-inch yellow band. The alternate marking of a yellow cylinder by painting the cylinder crown green and printing the word "NITROX" parallel to the length of the cylinder in green print is acceptable.

Timing Devices, Dive Computers, and Depth/Pressure Gauges

1. All divers must be equipped with an approved depth indicator and submersible tank pressure gauge.
2. All divers must also be equipped with an underwater time-keeping device (computer, bottom timer, or watch).
3. Multi-level dive computers are allowed in the DMF diving program. Care must be taken to follow the instructions for these instruments. Special ascent times (as slow as 20 feet per minute) may exist in some cases. Multi-level Dive Computers should be used in compliance with the specifications - of this manual in the Depth and Bottom Time Limitations section.
4. A single computer is not to be used by multiple divers on a dive. If a buddy team has only one computer between them, the person without the computer must dive by the decompression tables.
5. All tank pressure gauges and depth gauges will be inspected prior to each use. Tank pressure gauges will be inspected by a certified regulator mechanic annually as part of the regulator maintenance. Depth gauges will be calibrated and repaired as necessary. Inaccurate gauges shall not be used.

Buoyancy Compensating Devices (BCDs)

1. Each diver shall on every dive possess the capability of attaining and maintaining sufficient positive buoyancy to float effortlessly on the water's surface, through the use of a BCD. The BCD must have an automatic inflator that allows the unit to be inflated using air from the tank.
2. BCD and Weight Systems – All BCD's and weight belts will be equipped with quick release devices designed to permit jettisoning of the entire gear.

Inspection and Maintenance Records

Applicable Equipment

Pertinent inspections, tests, and maintenance services referred to in previous sections for the following equipment will be documented by each project/program responsible for maintaining diving equipment: SCUBA tanks, regulators, BCDs, submersible pressure gauges, depth gauges, tank valves, and dive computers.

Documentation

Documentation of maintenance shall include the date and nature of work performed, serial number of the item and name of the person/business performing the work. Appendix E is a suggested maintenance record format.

Section

6

Diving Emergencies

General Policy

Any diver may deviate from the requirements of this manual to the extent necessary to prevent or minimize a situation which is likely to cause death, or serious physical injury. A written report of such action must be submitted to the DCB explaining the circumstances and justifications for such action.

1. In all cases involving a diving accident, the Dive Supervisor, vessel captain and the US Coast Guard or medical personnel should be notified as soon as possible.
2. Trained personnel, if necessary should perform CPR and other life saving techniques. Qualified medical personnel should be consulted as soon as possible in the case of a diving accident or other severe injury.
3. In the event of a pressure related or other serious dive injury notify the US Coast Guard immediately.
4. Follow all instructions issued by the USCG, the recompression chamber officer, the proper medical authorities, and the vessel captain quickly and explicitly.
5. Keep the vessel captain informed on the victim's status.

Individual Responsibilities

It is the responsibility of all divers to constantly be aware of their own, and other's physical and mental states before, during and after conducting each dive. This is especially critical during deep dives, dives in cold water, and during dives where environmental conditions or required tasks may place excessive physical demands on the diver. All divers should report any problem or suspected problem immediately to the Dive Supervisor or Project Leader. Divers should never ignore pain or other potential symptoms of a diving related problem, regardless of how slight.

Pressure Related Injuries

In the event of a pressure related diving accident the Dive Supervisor or any other applicable diver should begin immediate examination and treatment using the Diving Accident Flow Chart (Appendix I). This chart should be used for embolism and the bends (decompression sickness). The following sections give some details concerning pressure related injuries:

Gas Embolism

Embolism is an absolute medical emergency and requires immediate treatment. If a diver who has breathed any source of air at depth is unconscious upon surfacing, or loses consciousness shortly after surfacing, it must be assumed that he has air embolism. Both gas embolism and decompression sickness are disorders that affect the whole body. Symptoms of gas embolism occur within 3 to 5 minutes of surfacing. One, a few, or all symptoms may be present.

Symptoms and Signs:

- Fatigue
- Weakness
- Dizziness
- Paralysis of extremities
- Visual disturbances such as blurring
- Feeling of a blow to the chest, progressively worsening
- Cough or shortness of breath
- Sudden unconsciousness
- Bloody, frothy sputum
- Staggering
- Confusion or difficulty in seeing (e.g. moving in wrong direction, bumping into things)
- Collapse or unconsciousness
- Convulsions
- Respiratory Arrest

Treatment:

- Refer to Flow Chart in Appendix I.
- Treatment for air embolism is immediate recompression in a recompression chamber.

Decompression Sickness

Decompression sickness (the bends, caissons disease) is the result of inadequate decompression following exposure to increased pressures. The quicker the victim is recompressed in a recompression chamber, the better the chances for recovery. Symptoms of decompression sickness are varied and are in many cases similar to air embolism. The effects of air embolism will be noticeable prior to or immediately after the diver surfaces. Any occurrence of symptoms more than 15 minutes after the diver reaches the surface can generally be assumed not to be air embolism.

Symptoms and Signs:

- Pain (generally localized), especially in joints
- Staggering, clumsiness, lack of response (as if drunk), weakness
- Paralysis or partial paralysis, numbness
- Botchy coloring or rash on skin, itching
- Shortness of breath
- Vision disorders
- Collapse and unconsciousness, convulsions

Treatment:

- Refer to Flow Chart in Appendix I.
- Recompression as quickly as possible.
- Any symptom including rash and pain is considered a serious symptom and should be treated as such.

Subcutaneous Emphysema

Subcutaneous emphysema has the same initiating mechanism as gas embolism but is not as serious. This condition results when air escapes into the tissues just under the skin (subcutaneous) and normally occurs in the area of the neck and/or collarbone.

Symptoms and Signs:

- Swelling or inflation around the neck
- Crackling sensation when skin is moved

- Change in sound of voice
- Difficulty in breathing or swallowing
- Feeling of fullness in neck area

Treatment:

- Unless complicated by air embolism, recompression should not be necessary.
- Oxygen should be administered if breathing is impaired or if requested by medical authorities.

Mediastinal Emphysema

Mediastinal emphysema may result from a ruptured pleural bubble or injury to the lung, esophagus, trachea, or main stem bronchus. While not serious in itself, it may be an indication of an air embolism.

Symptoms and Signs:

- Pain under the sternum (breastbone) which may radiate to the neck, neck bone or shoulder
- Shortness of breath
- Faintness
- Blueness (cyanosis) of skin, lips, or fingernails
- Difficulty breathing
- Shock

Treatment:

- Unless air embolism is also present recompression should not be necessary.
- Oxygen should be administered if breathing is impaired or if requested by medical authorities.

Pneumothorax

Pneumothorax is the result of the presence of air between the lung and the inner wall of the chest cavity. As the air continues to expand, partial or total collapse of the lung may result. In serious cases, displacement of the heart could result.

Symptoms and Signs:

- Sudden onset of cough
- Shortness of breath, rapid shallow breathing
- Sharp pain in the chest, usually made worse by breathing
- Blueness (cyanosis) of the skin, lips, and fingernails
- A tendency to bend the chest toward the side involved

Treatment:

- Administer oxygen
- If air embolism is not present, recompression may not be necessary
- If breathing is difficult, recompress the victim to a point of relief
- Contact medical authorities immediately.

Ear Squeeze

Ear squeeze is caused by failure to equalize the pressure difference between the external and middle ear spaces. In experienced divers, it is a common problem when diving with a cold or congestion. The congestion blocks the Eustachian tube leading to the throat and prevents equalization of pressure. Unless equalized, this can result in tissue damage and distortion or, in severe cases, ruptured eardrum. This injury can also be the result of a failure to equalize the ears (usually in less experienced divers). Divers should avoid diving when congested and/or take precautions prescribed by a physician.

Symptoms and Signs:

- Pain in ear during descent or ascent
- Sudden relief of pain if eardrum ruptures or middle ear equalizes (can be followed by vertigo if eardrum ruptures)
- Redness and swelling of the eardrums
- Bleeding into the external ear

Treatment

- Seek medical attention

Sinus Squeeze

Sinus squeeze is normally the result of diving with a cold or congestion. The inability to equalize pressure exerts excessive negative pressure on the mucous membrane, resulting in tissue damage.

Symptoms and Signs:

- Severe sharp pain in sinus areas (above, below, and between or behind the eyes)
- Sudden relief from pain as sinus clears
- Gradual relief of pain if pressure remains constant
- Bloody mucous discharge from nose or mouth, or blood in mask
- Tenderness in area of sinus

Treatment:

- In minor cases, no treatment is required.
- In more severe cases, seek medical attention as soon as possible.

Mask Squeeze

This is generally the result of failure to admit air into the mask during descent (failure to equalize by blowing into the mask through the nose). The pressure differential between the air pocket in the rigid mask and the soft tissues of the face can result in serious tissue damage. In serious cases, damage to the optic nerve and blindness may result.

Symptoms and Signs:

- Sensation of suction applied to face, or mask being forced into face
- Pain or a squeezing sensation
- Face swollen or bruised, "black eyes"
- Whites of eyes bright red
- Protrusion of eyeballs, with bleeding in eyeball, behind it and behind the eyelid

Treatment:

- Contact medical authorities as soon as possible.

Ruptured Eardrum

A ruptured eardrum can result in any situation where there is a rapid pressure change. This can occur when "chasing an object to the bottom," trying to descend or ascend while not being able to clear the ears, etc.

Symptoms and Signs:

- Severe pain on descent or ascent as rupture occurs
- Dizziness or nausea as water enters the middle ear
- Disorientation
- Ringing in the ear (tinnitus)
- Bleeding from the ear
- Redness and swelling of eardrum

Treatment:

- Contact medical authorities as soon as possible.

Gaseous Poisoning

While several conditions can be listed under gaseous poisoning only two will be listed for our purposes. These two are the most common problems that could be associated with DMF diving activities.

Carbon Dioxide Poisoning (CO_2)

Controlled breathing (skip breathing), while using SCUBA is a frequent cause of fatalities. Carbon dioxide poisoning usually comes on so fast that the period of rapid breathing reverts to unconsciousness in seconds.

Symptoms and Signs:

- Sometimes none until victim is unconscious
- An urge to breathe and noticeable air starvation
- Possible headache, dizziness, weakness, unusual perspiration, nausea
- Slowing of responses, confusion, clumsiness
- Unconsciousness, possibly including muscle twitching and convulsion in extreme cases

Treatment:

- Breathing fresh breathing gas or air will usually relieve all symptoms.
- If diver is unconscious, refer to Appendix I.

Carbon Monoxide Poisoning (CO)

The most frequent cause of carbon monoxide poisoning is the toxic fumes from compressor exhaust entering the air intake. When carbon monoxide is breathed it prevents blood from transporting oxygen, causing tissue hypoxia.

Symptoms and Signs:

- Headache
- Nausea
- Dizziness
- Weakness
- Confusion
- Clumsiness
- Feelings of tightness in the head
- Abnormal redness or blueness of lips, fingernails, and skin.

Treatment:

- A source of fresh air should be provided for the victim
- if available, oxygen
- Contact medical authorities as soon as possible.

Other Diving Related Emergencies

Drowning

Drowning is one of the major causes of diving fatalities. The term drowning indicates that a victim is recovered from the water unconscious and not breathing.

Symptoms and Signs:

- Unconsciousness
- Cyanosis
- Respiratory arrest.

Treatment:

- Artificial respiration and CPR if necessary
- See Appendix I.

Hypothermia

When the deep tissue or core temperature of the body falls below the normal physiological range hypothermia occurs. If the core temperature continues to drop, serious consequences usually develop. Hypothermia can occur during a dive and could affect a divers ability to make judgments and perform simple tasks.

Symptoms and Signs:

- uncontrollable shivering
- Slurred speech
- confusion
- pink and cold clammy skin
- shock
- unconsciousness

Treatment:

- Administer CPR and rescue breathing if necessary
- Contact medical authorities as soon as possible
- Do not remove the diver from the wetsuit
- Re-warm as quickly as possible by directing warm water onto the trunk area (110 degrees F).

Note: Try not to get warm water onto the extremities as the release of cold blood from the extremities during re-warming can cause a dangerous fall in body temperature. Wrap the victim in blankets and treat for shock. Do not administer hot liquids. Small amounts of warm (110° F) liquids may be administered.

Motion Sickness

Motion sickness can be a distinct hazard to the diver. Divers should not dive when suffering seriously from this condition. The effects of vomiting while submerged can include strangulation and death.

Symptoms and Signs:

- Dizziness
- nausea
- wooziness
- dry tongue
- pallid complexion
- slurred speech
- marked change in attitude
- Vomiting and dry heaves.

Treatment:

- A number of motion sickness drugs are commercially available which alleviate the symptoms. Many of these drugs may produce side effects, which are contradictory to diving
- Divers who suffer from motion sickness should check with their physician for treatments.

Unconscious Diver

Symptoms and Signs:

- A diver retrieved from the water unconscious, or collapses soon after (within 15 minutes from a dive).

Treatment and procedures:

- If the victim is not breathing, begin rescue breathing and CPR if necessary.
- Contact medical authorities immediately.
- Refer to Appendix I.
- If any doubt remains as to the cause, assume the worst and treat for gas embolism.

Section

7

Definitions

Bounce Dive - A dive of relatively short duration. Generally less than 10 minutes

Bottom Time - The total elapsed time measured in minutes from the time the diver leaves the surface in descent to the time the diver begins direct ascent to the surface. As an added safety measure the ARP diving program will compute from time of descent to time of completed ascent. If multi-level dive computers are being used, follow the bottom time listed on the computer.

Buddy Breathing - The sharing of a single air source between divers.

Buddy Diver - Second member of dive team.

Buoyancy Compensator Device - The BCD or BC provides buoyancy when needed and can be orally inflated, power inflated (from the air cylinder) and CO2 inflated.

Cylinder - A pressure vessel for the storage of gases (i.e. SCUBA tank)

Decompression Chamber - A pressure vessel for human occupancy such as a surface decompression chamber, closed bell, or deep diving systems used to decompress divers and to treat decompression sickness.

Dive - A descent into the water using compressed breathing gas, an underwater activity and ascent to the surface.

Dive Location - A description of site, material, coordinates or other defining criteria of the actual location of the dive.

Dive Platform - A surface or vessel from which a diving operation is conducted.

Dive Table - A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures. Not for use when using multi-level dive computers.

Dive Team - Divers and support individuals who are exposed to or control the exposure of others to hyperbaric or underwater Dive conditions.

Emergency Ascent - An ascent made when the diver is low or out of air. May also be used to refer to an ascent made when the diver is under excessive stress.

Hyperbaric Conditions - Pressure conditions in excess of normal atmospheric pressure.

No Decompression Limits - The depth-time limits determined by the no decompression limits and repetitive dive group designations table for no decompression air dives, U.S. Navy Diving Manual or equivalent limits, which are at least as conservative.

Normal Ascent - An ascent made with an adequate air supply at a rate of 60 feet per minute or less.

Octopus Regulator - A regulator first stage with (2) second stages attached. Often the term refers solely to the additional second stage, which is considered an important safety factor.

Regulator - A regulator controls the flow of air from the compressed air cylinder to the diver. The regulators primarily in use today deliver air on demand, and consist of two stages, which reduce the gas in an air cylinder to ambient or surrounding pressure. In a single hose or modern regulator, the first stage is attached to the cylinder valve and a hose connects the second stage.

Repetitive Dive - A dive performed within 12 hours of a previous dive.

Scientific Diving - All diving performed by individuals necessary to and part of a scientific, research, or educational activity; in conjunction with a project or study under the jurisdiction of any public or private research or educational institution or similarly recognized organization, department, or group.

SCUBA Diving - A diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus.

Tank - (see cylinder)

Working Pressure - The normal pressure at which a system is designed to operate.

Section

8

Appendices

APPENDIX A

NORTH CAROLINA DIVISION OF MARINE FISHERIES
STATEMENT OF ACKNOWLEDGEMENT AND UNDERSTANDING

The undersigned hereby acknowledges that he/she has read and understands the North Carolina Division of Marine Fisheries' Diving Safety Manual, and agrees to comply with the regulations of this manual in all matters concerning his/her participation in the Scientific Diving Program.

_____ _____

Signature of Diver Date

_____ _____

Date Received Chairman, DCB

APPENDIX B

NORTH CAROLINA DIVISION OF MARINE FISHERIES
APPLICATION TO PARTICIPATE IN THE SCIENTIFIC DIVING PROGRAM

Print Name_____ _____ _____
(First) (WI) (Last)

Phone Numbers: Work ( )_____ Home ( )_____

In case of an emergency, contact _____ _____
Name Phone #

Diving Training or Certification organization: _____
(Attach copies of each card or certificate)

Other Training

CPR No ____ Yes____, If yes, Certification organization_____

First Aid No ____ Yes____, If yes, Certification organization_____

Oxygen First Aid No ____ Yes____, If yes, Certification organization_____

Others _____

_____

Complete the following Dive History:

Depth Range	Number of Dives
0 to 30 ft.	_____
31 to 60 ft.	_____
61 to 100 ft.	_____
101+ ft.	_____

Total Number of Dives to Date _____

Check the activities, environments and equipment for which you have diving experience:

_____Ocean _____Surface Decompression

_____Surface Supplied
_____Lakes
_____Mixed Gas SCUBA
_____Rivers
_____Strong Current
_____Cold Water
_____Tropical Water
_____Wreck Diving
_____Twin SCUBA tanks
_____U/W Still Photography
_____Recompression Chamber
_____Saturation
_____Lift Bags
_____Night Diving
_____U/W Data Collection
_____Dry Suit
_____Low Visibility
(5 ft. or less)
_____U/W Fish Identification
_____U/W Video Photography

Have you ever-experienced decompression sickness, air embolism, or other diving related illness? ____no ____yes, If yes, Date_____ Location_____

Circumstances_____
_____
_____

If you answered **Yes** to the above question then, have you been cleared to resume diving by a qualified physician?

____no ____yes, If yes, Physician's Name_____

Your Signature_____

Date_____

DCB Member	Date	Approved/Denied

APPENDIX C

NORTH CAROLINA DIVISION OF MARINE FISHERIES
DIVING FITNESS MEDICAL EVALUATION

TO THE PHYSICIAN:

_____ requires a medical examination to assess his/her fitness to participate as a SCUBA diver in the North Carolina Scientific Diving Program.

SCUBA diving can be physically strenuous and potentially dangerous. A special risk is present if the middle ear, sinuses or lung segments do not readily equalize changes in air pressure. Most fatalities associated with SCUBA diving involve deficiencies in prudence, judgment or physical fitness.

Based on your examination of this individual, the Division would like your impression as to whether he/she is physically qualified to participate in diving activities. The following additional information is provided for your consideration in making this decision:

Absolute Contraindications to Diving

1. Persons subject to spontaneous pneumothorax.
2. Persons subject to epileptic seizures or syncopal attacks.
3. Lung cysts or definite air-trapping lesions on chest X-ray.
4. Active asthma.
5. Drug addiction.

6. Brittle diabetes where individual is subject to insulin shock or diabetic coma.
7. Perforated eardrum.
8. Ear surgery with placement of plastic strut in air-conduction chain.
9. Pregnancy.
10. History of Myocardial Infarction.

Relative Contraindications to Diving

1. Decreased pulmonary reserve from any cause.
2. Malignancies (active) unless treated and without recurrences for 5 years.
3. Gross obesity.
4. History of thoracotomy.
5. Impaired vision or blindness in one eye.
6. Chronic inability to equalize sinus and/or middle ear pressure.
7. Impaired organ function caused by alcohol or drug use.
8. Conditions requiring continuous medication for control.
9. Meniere's disease.
10. Hemoglobinopathies.
11. Cardial abnormalities.
12. Juxta-articular osteonecrosis.

APPENDIX C (cont.)

To the Division of Marine Fisheries' Diving Control Board Chairman:

I have examined _____, and found him/her to be:
(name of applicant)

☐ Please check if participant is over the age of 40

_____qualified to participate in SCUBA diving activities.

_____NOT qualified to participate in SCUBA diving activities due to defects which, in my opinion, would constitute unacceptable hazards to his/her health and safety.

Signature_____ _____
(Examining Physician) (Date)

Address_____

_____

_____ _____
Date Received Chairman, DCB

APPENDIX D

NORTH CAROLINA DIVISION OF MARINE FISHERIES
DIVE PLAN

DATE: _____

☐ Check here if diving incident occurred during diving operations. If checked, please attach appendix I to this report and give to Diving Control Board Member immediately

Project/Program:_____

Prepared by:_____

Dive Location/Site:_____

Dive Platform:_____

Date(s) of Planned Dive(s):_____

Description of Diving Operations:_____

Special Equipment Used:_____

Divers:_____
_____
_____
_____

Depths and Durations of Dives:_____

Expected Environmental Conditions (wind speed and direction, wave height):
_____
_____
_____

Nearest Recompression Chamber: Phone Number ( ) _____-_____
Address _____
_____
_____

Nearest Medical Facilities: Phone Number ( ) _____-_____
Address _____
_____
_____

APPROVAL: _____ DATE:_____

APPENDIX E

NORTH CAROLINA DIVISION OF MARINE FISHERIES
DIVING EQUIPMENT MAINTENANCE LOG

Equipment:_____ (i.e. regulators, tanks, BCDs, etc.)

Identification/ Serial #	Nature of Maintenance	Date of Maintenance	Conducted by	Comments

APPENDIX F

CONTACT POINTS FOR DIVING
MEDICAL EMERGENCIES

RADIO COMMUNICATIONS:

Due to the importance of speed in successfully treating many diving medical emergencies, reliable radio communications with land-based operators having direct access to a telephone is critical in arranging for prompt transportation and treatment of victims. Radio communications should be checked prior to and during any diving mission, especially when operating offshore.

U.S. Coast Guard - Monitors VHF Channels 16 and 22. If your radio range is such that you cannot directly reach a Coast Guard Station, try to relay through a second party.

Division of Marine Fisheries - Upon request will monitor Marine VHF. Since the range is limited it is probably best to use the Coast Guard.

TELEPHONE COMMUNICATIONS:

Since telephone communications will be necessary to arrange for medical assistance, land based emergency transportation or use of the nearest recompression chamber, the following phone numbers are provided in order to expedite relayed message traffic from the dive vessel to the appropriate authorities:

Diving Accident Network (DAN), Duke University

*** **EMERGENCY NUMBER (919) 684-8111** (24 HOURS)***
Non-emergency (Business) (919) 684-2948

North Carolina Coastal Area Hospitals

Outer Banks Hospital (252) 449-4500 or 1-877-359-9179
4800 Croatan Hwy
Nags Head, NC 27959

Carteret General (252) 808-6000
3500 Arendell St
Morehead City, NC 28557

Craven Regional Medical Center (252) 633-8111
2000 Neuse Blvd.
New Bern, NC 28561

New Hanover Regional (910) 343-7000
2131 South 17th St.
Wilmington, NC 28401

Hyperbaric Chambers

Duke Center for Hyperbaric Medicine & Environmental Research
(919) 684-3305 or (919) 684-6726
Duke University Medical Center
Durham, NC 2771

APPENDIX G

NORTH CAROLINA DIVISION OF MARINE FISHERIES
DIVING LOG

NCDMF HABITAT AND ENHANCEMENT DIVING LOG

DATE: ____/____/____ PAGE ____ OF ____

PRINICPAL INVESTIGATOR: ________________________________ PLATFORM: ____________________________________

LEAD DIVER : ____ PROJECT NUMBER: ________________________________

Dive Site	Dive No.	Diver's Name	Surf. In. (hr:min)	Tank Number	Comp. Number	Cylinder Size	Acknowledgement		MOD*	Dive Plan		PSI	Time		Depth	ABT**
							N_2O_2 %	Initials		Depth	BT		Down	Up		
								DV				In				
								DM				Out				
								DV				In				
								DM				Out				
								DV				In				
								DM				Out				
								DV				In				
								DM				Out				
								DV				In				
								DM				Out				
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								DM				Out				
								DV				In				
								DM				Out				

* Maximum Operating Depth (MOD) - the maximum depth allowed using the specified enriched air mix.
** Actual Bottom Time (ABT) - the time the diver leaves the surface until the time the diver begins ascent from the bottom.

APPENDIX G (cont.)

NCDMF DIVING LOG

	Site A	Site B	Site C	Site D
Dive Location				
GPS Coordinates	__ __ ° __ __ . __ __ __ N __ __ ° __ __ . __ __ __ W	__ __ ° __ __ . __ __ __ N __ __ ° __ __ . __ __ __ W	__ __ ° __ __ . __ __ __ N __ __ ° __ __ . __ __ __ W	__ __ ° __ __ . __ __ __ N __ __ ° __ __ . __ __ __ W
Type of Reef				
Wind Speed (knots)				
Sea State (feet)				
Air Temperature (°F)				
Water Temperature (°F)				
Visibility (feet)				
Bottom Type				
Comments (includes comments on other species observed, unusual occurences, gear malfunction, etc.)	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____
Tasks (the intent of the dive and tasks that are accomplished at the site)	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____

Special Dive Equipment					
☐ Dry Suits	☐ Spears/Gigs	☐ Bang Sticks	☐ Dive Reel	☐ Full Face Mask SCUBA	☐ _____
☐ Dive Computers	☐ Shifting Rods	☐ Photography	☐ Transponder Unit	☐ U/W Communications	☐ _____
☐ Enriched Air	☐ Spear Gun	☐ Video Camera	☐ Lift Bags	☐ Umbilical Supplied	☐ _____

APPENDIX H

NORTH CAROLINA DIVISION OF MARINE FISHERIES
NON-EMPLOYEE DIVER WAIVER FORM

WAIVER OF LIABILITY

Whereas, I_____, am about to act as a DIVER and passenger on_____ and use facilities and/or equipment owned by the North Carolina Division of Marine Fisheries; and, whereas, I am doing so entirely upon my own initiative, risk, and responsibility; now therefore, in consideration of the permission extended to me by the State of North Carolina through its officers and agents to perform said DIVING or use said facilities, I do hereby for myself, my heirs, executors, and administrators, remise, release, and forever discharge the State of North Carolina of all claims, demands, actions or causes of action on account of my death or on account of an injury to me which may occur by reasons of said DIVING activities, travel or use of facilities. It is further understood and agreed that this release, among others things, extends to and includes negligence on the part of personnel and structural failure of vessels, vehicles, or facilities. If under age 18, this release must also be signed by parent or guardian.

SIGNATURE_____

DATE OR BIRTH_____

PARENT OR GUARDIAN_____

(signature)

Name of Person to be notified in case of

Emergency_____

_____

Approved by_____

DATE_____

Verified_____

DATE_____

APPENDIX I

NORTH CAROLINA DIVISION OF MARINE FISHERIES
DIVING EMERGENCY ASSISTANCE FORM

Diver Information

Name:_____ **Age:**_____

Address:_____

_____

____

Emergency Contact Phone:_____

Current Complaint:_____**diff**_____

_____

_____

___

Significant Past Medical History (medications, allergies, previous injuries, etc.)

_____

_____

_____

Dive Profile

Dive Profile (Including safety stop/deco)	Depth	Time	Surface Interval
Exit water time: AM/PM	Breathing Gas: Air / Nitrox (Mix ----------%)		

APPENDIX I (cont.)

Emergency Assistance Plan

Initial Contact Information: _____

_____

Emergency Medical Assistance: _____

_____

Nearest Medical Facility Directions: _____

_____

_____

Phone: _____

DAN Medical Information:

Divers Alert Network 1-800-446-2671 or (919) 684-8111 or (919) 684-4326**

DAN TravelAssist (215) 245-2461 or 1-800-326-3822**

****In an emergency CALL COLLECT**

Other important information: _____

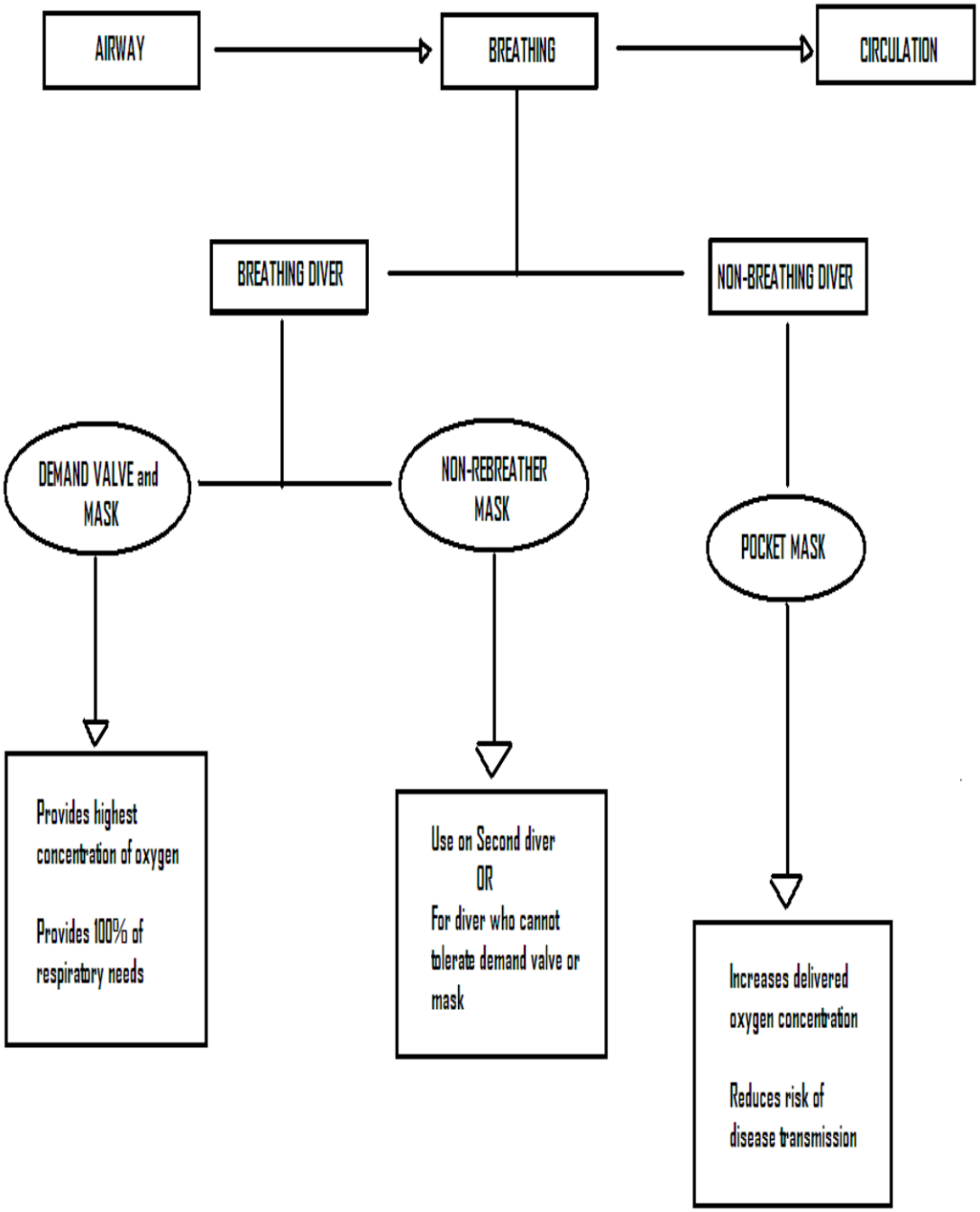
_____

_____

_____

Phone: _____

BASIC OXYGEN PROVIDER FLOW CHART



APPENDIX J

NORTH CAROLINA DIVISION OF MARINE FISHERIES
ON-SITE NEUROLOGICAL EXAMINATION

DAN Medical Center

By Ed Thalmann, M.D., Assistant Medical Director of DAN

Information regarding the injured diver's neurological status will be useful to medical personnel in not only deciding the initial course of treatment but also in the effectiveness of treatment. Examination of an injured diver's central nervous system soon after an accident may provide valuable information to the physician responsible for treatment. The On-Site Neuro Exam is easy to learn and can be done by individuals with no medical experience. Perform as much of the examination as possible, but do not let it interfere with evacuation to a medical treatment facility.

Perform the following steps in order, and record the time and results.

1. Orientation

- Does the diver know his/her own name and age?
- Does the diver know the present location?
- Does the diver know what time, day, and year it is?

Note: Even though a diver appears alert, the answers to these questions may reveal confusion. Do not omit them.

2. Eyes

- Have the diver count the number of fingers you display, using two or three different numbers.
- Check each eye separately and then together.
- Have the diver identify a distant object.
- Tell the diver to hold head still, or you gently hold it still, while placing your other hand about 18 inches/0.5 meters in front of the face. Ask the diver to follow your hand. Now move your hand up and down, then side to side. The diver's eyes should follow your hand and should not jerk to one side and return.
- Check that the pupils are equal in size.

3. Face

- Ask the diver to purse the lips. Look carefully to see that both sides of the face have the same expression.
- Ask the diver to grit the teeth. Feel the jaw muscles to confirm that they are contracted equally.
- Instruct the diver to close the eyes while you lightly touch your fingertips across the forehead and face to be sure sensation is present and the same everywhere.

4. Hearing

- Hearing can be evaluated by holding your hand about 2 feet/0.6 meters from the diver's ear and rubbing your thumb and finger together.
- Check both ears moving your hand closer until the diver hears it.
- Check several times and compare with your own hearing.

Note: If the surroundings are noisy, the test is difficult to evaluate. Ask bystanders to be quiet and to turn off unneeded machinery.

5. Swallowing Reflex

- Instruct the diver to swallow while you watch the "Adam's apple" to be sure it moves up and down.

6. Tongue

- Instruct the diver to stick out the tongue. It should come out straight in the middle of the mouth without deviating to either side.

7. Muscle Strength

- Instruct the diver to shrug shoulders while you bear down on them to observe for equal muscle strength.
- Check diver's arms by bringing the elbows up level with the shoulders, hands level with the arms and touching the chest. Instruct the diver to resist while you pull the arms away, push them back, up and down. The strength should be approximately equal in both arms in each direction.
- Check leg strength by having the diver lie flat and raise and lower the legs while you resist the movement.

8. Sensory Perception

- Check on both sides by touching lightly as was done on the face. Start at the top of the body and compare sides while moving downwards to cover the entire body.

Note: The diver's eyes should be closed during this procedure. The diver should confirm the sensation in each area before you move to another area.

9. Balance and Coordination
Note: Be prepared to protect the diver from injury when performing this test.

- First, have the diver walk heel to toe along a straight line while looking straight ahead.
- Have her walk both forward and backward for 10 feet or so. Note whether her movements are smooth and if she can maintain her balance without having to look down or hold onto something.

- Next, have the diver stand up with feet together and close eyes and hold the arms straight out in front of her with the palms up. The diver should be able to maintain balance if the platform is stable. Your arms should be around, but not touching, the diver. Be prepared to catch the diver who starts to fall.
- Check coordination by having the diver move an index finger back and forth rapidly between the diver's nose and your finger held approximately 18 inches/0.5 meters from the diver's face. The diver should be able to do this, even if you move your finger to different positions.
- Have the diver lie down and instruct him to slide the heel of one foot down the shin of his other leg, while keeping his eyes closed. The diver should be able to move his foot smoothly along his shin, without jagged, side-to-side movements.
- Check these tests on both right and left sides and observe carefully for unusual clumsiness on either side.

Important Notes:

- Tests 1,7, and 9 are the most important and should be given priority if not all tests can be performed.
- The diver's condition may prevent the performance of one or more of these tests. Record any omitted test and the reason. If any of the tests are not normal, injury to the central nervous system should be suspected.
- The tests should be repeated at 30- to 60-minute intervals while awaiting assistance in order to determine if any change occurs. Report the results to the emergency medical personnel responding to the call.
- Good diving safety habits would include practicing this examination on normal divers to become proficient in the test.
- Examination of an injured diver's central nervous system soon after an accident may provide valuable information to the physician responsible for treatment.
- The On-Site Neuro Exam is easy to learn and can be done by individuals with no medical experience at all.

APPENDIX K

NORTH CAROLINA DIVISION OF MARINE FISHERIES
USING THE DAN EMERGENCY HOTLINE

+1-919-684-8111 or +1-919-684-4DAN (Collect)

Whenever you need help, DAN is there. DAN's medical staff is on call 24 hours a day, 365 days a year, to handle diving emergencies such as decompression sickness, arterial gas embolism, pulmonary barotrauma, or other serious diving-related injuries. Each year, DAN answers more than 2000 calls on the diving emergency hotline from its members and divers.

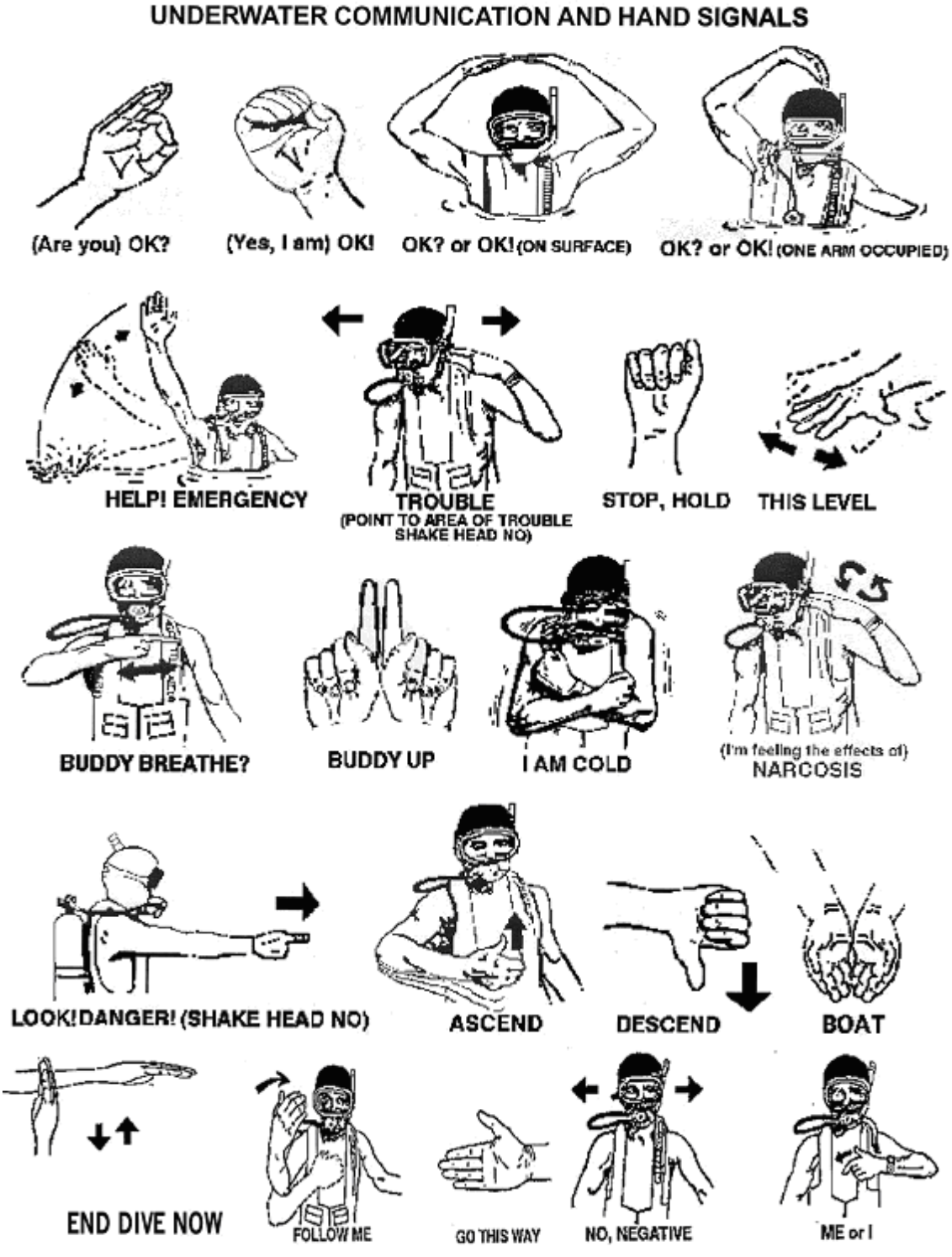
When you call the DAN Emergency Hotline:

- The numbers **+1-919-684-8111** and **+1-919-684-4DAN (-4326)** are answered at the switchboard of Duke University Medical Center. **Tell the operator you have a diving emergency.** The operator will either connect you directly with DAN or have someone call you back at the earliest possible moment.
- DAN's medical staff may make an immediate recommendation or call you back after making arrangements with a local physician or the DAN Regional Coordinator. DAN Regional Coordinators are familiar with chamber facilities in their area, and because they're qualified in diving medicine, they can make recommendations about treatment.
- DAN's medical staff or Regional Coordinator may ask you to wait by the phone while they make arrangements. These plans may take 30 minutes or longer, as several phone calls may be required. This delay should not place the diver in any greater danger. **However, if the situation is life-threatening**, arrange to transport the diver immediately to the nearest local medical facility for immediate stabilization and assessment of his or her condition. Call DAN TravelAssist at

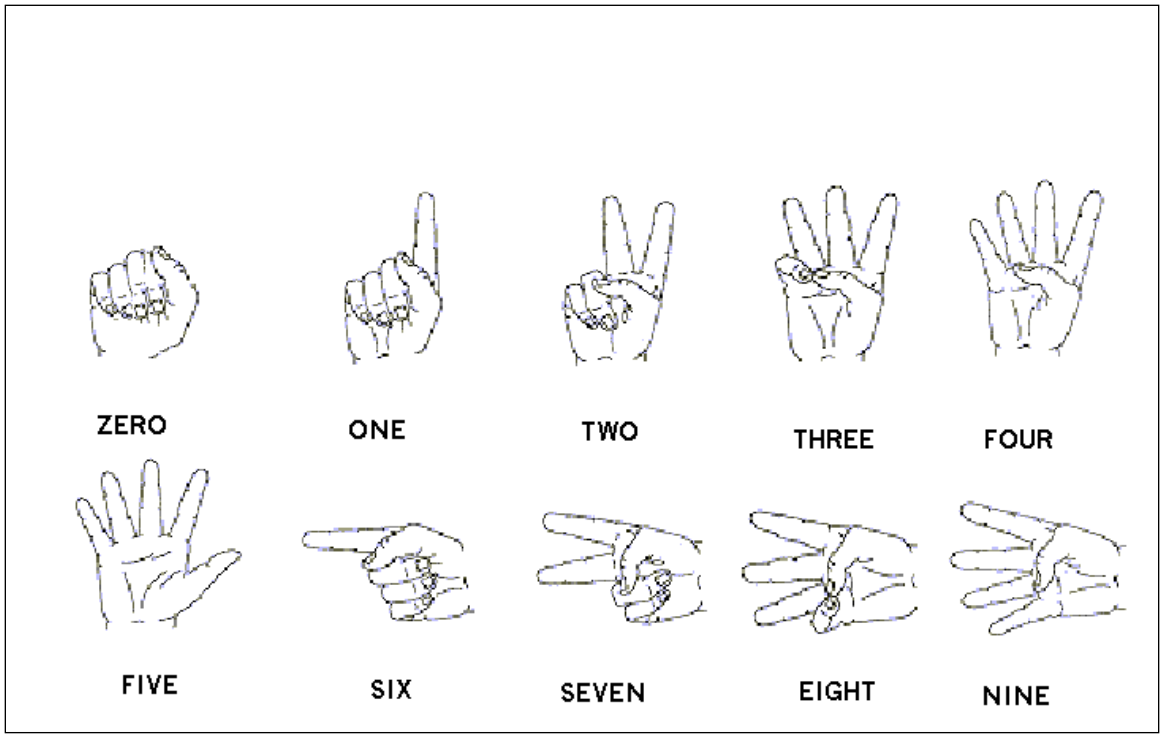
  1-800-326-3822 at this time for consultation with the local medical provider.

Appendix L

NORTH CAROLINA DIVISION OF MARINE FISHERIES
UNDERWATER COMMUNICATION AND HAND SIGNALS



Numerical hand signals



APPENDIX M

NORTH CAROLINA DIVISION OF MARINE FISHERIES
ANNUAL DIVE SAFETY CHECKLIST

Diver Name_____

SCIENTIFIC DIVER ELIGIBILITY	Date	Check
1. DMF Diving Safety Manual, Appendix A signed	_____	_____
2. DMF Diving Safety Manual, Appendix B approved	_____	_____
3. Proof of nationally recognized diver certification	_____	_____
4. 10 Scientific Dives (5 observation, 5 working)	_____	_____

EMPLOYEE PROFICIENCY REQUIREMENTS FOR "ACTIVE" STATUS

Annual Checklist

Sampling Season Calendar Year	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Current Dive Physical, Appendix C, DSM							
Current CPR							
Current first aid							
Current O_2 administration							
Annual Dive Safety Training – Pool							
Annual Dive Safety Training – Open Water							
At least 3 DMF scientific dives in previous year							
At least 3 other dives in previous year							
At least 1 dive at current certification depth or deeper in previous year							
Diving Control Board CB Approval (Date)							

Status: _____ _____ _____ _____ _____ _____ _____

APPENDIX N

NORTH CAROLINA DIVISION OF MARINE FISHERIES
TEMPORARY SCIENTIFIC DIVER CHECKLIST

1. Statement of Acknowledgement and Understanding (Appendix A)
2. Non-Employee Diver Waiver Form, if Applicable(Appendix H)
3. Application to Participate in Scientific Diving Program (Appendix B)
4. Proof of Nationally Recognized Diver Certification. Organization _____ Cert. Date_____
5. Diving Fitness Medical Evaluation (Appendix C). Expiration Date _____
6. CPR. Expiration Date _____
7. First Aid. Expiration Date _____
8. O_2 Administration. Expiration Date _____

APPENDIX O

Note: This form shall be used by NCDMF Dive Supervisors to report diving related incidents both minor and major, including those that require hospitalization. An additional narrative and detailed analysis of the incident MUST be attached. All incidents

I. GENERAL INFORMATION ON ACCIDENT VICTIM

Diver Name:	Date & Time of Incident
Incident Location	Diving Certification Level
Current Medications & Health Problems	

NCDMF SDIT and non-NCDMF Divers complete this section. All other NCDMF divers skip to next section

Age:	Sex:	Highest Dive Certification	Certifying Agency
# Years Diving	Total # Dives	# Dives last 6 Months	Previous Dive Incidents & Dates

II. EQUIPMENT USED BY INCIDENT VICTIM

Breathing Loop	Diver Dress	Dive Cylinder Type & Size	Cylinder Pressure
☐ Open-Circuit	☐ None/Dive Skin		In Out
☐ Semi-Closed/ Closed Circuit	☐ Wet Suit Thickness _____		NCDMF Issued Equipment? ☐ Yes ☐ No; FFM ☐ Yes ☐
☐ Surfaced Supplied	☐ Dry Suit	Breathing Gas	Diver Familiar with Equipment?
☐ Snorkel			

III. DIVE INFORMATION - Incident Dive

** Additional information can be found on Dive Log (Appendix G)

Name of on site DIVE SUPERVISOR & LEAD DIVER	Program Number & Dive Purpose
Dive Buddy / Affiliation	Dive Platform
_____ _____	# Dives Day of Incident / # Dives Previous Day
_____ _____	Type of Dive: ☐ Work ☐ Observer / Dive(s) conducted with: ☐ Tables ☐ Dive Computer (Model)_____
_____ _____	

☐ Yes ☐ No	Was dive typical of diver's normal type of diving?	If **NO,** Explain:

V. EMERGENCY PROCEDURES

Yes	No		Yes	No	
☐	☐	Emergency oxygen available on-site?	☐	☐	Pre-dive briefing plan in place for dive site?
☐	☐	Emergency scenarios (low on/out of air, lost buddy, etc.) discussed with all divers prior to diving operations?	☐	☐	Dive accident management plan reviewed by all divers & support prior to diving operations?

VII. ON SITE MEDICAL TREATMENT

Time of injury	Signs, Symptoms, & location on body	
Emergency Services Contacted		
	On-site 1st aid treatment	
Time Contacted	On-Site Oxygen Administration	
Time EMS Arrival	Delivery Method _____ Start Time _____ Stop Time _____	

Pre-Dive Health	Sickness noted, previous 72 hrs.	Fatigue prior to dive ☐ Yes ☐ No
		Strenuous exercise 6 hrs pre to 12 hrs post dive ☐ Yes ☐ No

** Attach all follow-up medical records (ER, Hospital, Hyperbaric Chamber) **

NOTE: A Diving Incident Report shall be completed by the Diving Supervisor(s) and be submitted to the DCB within 10 business days of the diving incident. This report shall consists of the following items:

1. Diving incident Report
2. Dive Supervisor narrative
3. Dive Log (Appendix G)
4. Appendix I

The DCB shall submit the report, along with analysis and recommendations for prevention of future injuries **within 30 days**

_____	_____	_____
Printed Name Dive Supervisor	Signature Dive Supervisor	Date

APPENDIX P

Scientific Diver NCDMF Annual Training Form					
Diver					
General Water Skills					
25yd sub surface one breath					
500yd w/o swim aids					
tread water w/hands=10 minutes, w/o hands=3 min					
transport another person 25 yd w/o swim aids					
Primary Regulator Exercise (x2)					
Donning and Doffing AGA/Guardian					
Buddy Breathing					
Remove/ Replace Scuba U/W					
Emergency Swimming Ascent Procedures					
Sampling Equipment					
Shackle, Zip Tie, Bowline, Safety Sausage, All Equipment					
Trim and Swim Control					
Navigation					
Retrieval unconscious diver to surface					
bring to surface					
rescue breathing					
transport					
remove from water					
Diving Emergency scenario					
Classroom: Dive Table exercise/ Dive planning					

APPENDIX P (cont.)

Scientific Diver In Training Pool Evaluation Form				
Diver				
General Water Skills				
25yd sub surface one breath				
375yd w/o swim aids				
500yd with mask, snorkel, fins				
500yd scuba with snorkel alternation				
tread water w/hands=10 minutes, w/o hands=3 min				
transport another person 25 yd w/o swim aids				
Primary Regulator Exercise (x2)				
Donning and Doffing AGA/Guardian				
Buddy Breathing				
Remove/ Replace Scuba U/W				
Emergency Swimming Ascent Procedures				
Sampling Equipment				
Shackle, Zip Tie, Bowline, Safety Sausage, All Equipment				
Trim and Swim Control				
Navigation				
Retrieval unconscience diver to surface				
bring to surface				
rescue breathing				
transport				
remove from water				
Diving Emergency scenario				
Classroom: Dive Table exercise/ Dive planning				
Diving Emergency scenario				