Pfiesteria: Background Information and Contingency Plan

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Prepared for:
New Jersey Department of Environmental Protection (DEP)
New Jersey Department of Health and Senior Services (DHSS)

By:
DEP - Division of Fish & Wildlife (DF&W)
DEP - Division of Responsible Party Site Remediation (DRPSR)
DEP - Division of Science, Research & Technology (DSRT)
DEP - Division of Watershed Management (DWM)
DHSS - Division of Epidemiology, Environmental and Occupational Health (DEEOH)

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Background

Summary

- *Pfiesteria,*(pronounced “fee-steer-ee-uh”), *and Pfiesteria* - like species are microscopic aquatic life forms known as a dinoflagellates; a group of single celled organisms which have the ability to swim in the water column. This group of organisms is known to exhibit characteristics of both plants and animals.

- *Pfiesteria piscicida* (*Pfiesteria*) is sometimes referred to as the “phantom dinoflagellate,” or “ambush algae,” because it can stay dormant in the sediment for long periods, suddenly emerge en masse to prey upon fish, and then vanish just as quickly from the water column. This characteristic makes it very difficult to effectively monitor for the organism in the environment.

- *Pfiesteria* was first identified and characterized in 1991. It has been found in coastal waters and tributaries of the East Coast and the Gulf of Mexico. It is assumed that the organism has existed for thousands of years. It has not been found in freshwater lakes or streams.

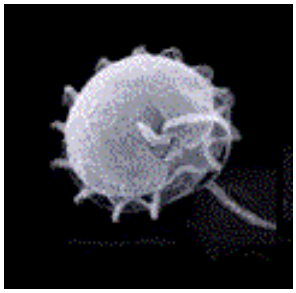


Figure 1

- The organism is not a disease-causing pathogen (e.g. the organism does not multiply within the body, nor is it contagious to other persons); rather it is the toxin produced by the organism that causes the adverse health effects observed.

- *Pfiesteria piscicida* is a polymorphic organism (see Figures 1 & 2) with as many as twenty-four (24) different stages in its life cycle, only a few of which produce toxins. *Pfiesteria piscicida* possesses a wide temperature and salinity tolerance, ranging from nearly freshwater (2 psu) to full-strength seawater (35 psu), and temperatures between 50°F and 90°F. However, toxic outbreaks occur most frequently when water temperature is about 75°F or greater, and at a salinity of around 15 psu. Additional environmental conditions suspected to trigger toxic outbreaks of *Pfiesteria* include calm - slow flowing waters and large amounts of fresh fish secreta/excreta.

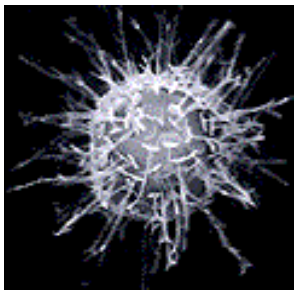


Figure 2

- Besides preying upon fish, *Pfiesteria piscicida* is known to be a predator of other estuarine microorganisms, such as bacteria, algae, and ciliates. Under laboratory conditions, *Pfiesteria* has demonstrated toxicity to every finfish and shellfish species tested, including blue crabs, young eastern oysters, littleneck clams, bay scallops, striped bass, mullet, croakers, spot, eel, menhaden, flounder, and largemouth bass. In waters where *Pfiesteria* is known to occur under natural conditions, the organism is associated with a finfish commonly referred to as

menhaden, or “moss bunker.” Menhaden are a small fish, up to fourteen (14) inches in length, that are commonly used for bait or animal feed.

- The exact structure of the two (2) known *Pfiesteria* toxins is not as yet understood; however, it is known that one toxin depresses the central nervous system while the other dissolves the skin mucus layers.

- *Pfiesteria* has been linked both to massive fish kills in North Carolina’s Albemarle-Pamlico estuary, starting in the early 1990's, and to recent (1997) fish kills in the Pocomoke and Chicamacomico Rivers, and King’s Creek, three tributaries to the Chesapeake on Maryland’s Eastern Shore (see Figure 3).

- Presently, testing for the presence of *Pfiesteria* is complicated, time -consuming, and requires highly specialized facilities, equipment, and training. No short term, simple laboratory tests for confirmation of the presence of the organism or the toxins exist to determine exposure, although ongoing research is promising.

Figure 3

Possible Human Health Effects

- *P. piscicida* has been linked to serious human health effects among laboratory workers exposed to either water or aerosols from *Pfiesteria* cultures in the toxic stage. Effects include epidermal lesions, respiratory distress, stomach cramping, disorientation, behavioral changes, erratic heart beat, short-term memory loss and/or severe cognitive impairment, and compromised immune systems. Most of these effects reverse over time.

- Recently, commercial watermen working in the affected areas in Maryland, have exhibited many of the symptoms linked to *Pfiesteria* exposure in the laboratory, namely skin lesions, memory loss, respiratory problems, stomach cramps and vomiting.

Current New Jersey Situation

- By correlating the known environmental condition preferences of *Pfiesteria* and *Pfiesteria*-like organisms with the Department of Environmental Protection (DEP) ambient water monitoring database, a map demonstrating an estimation of the level of potential risk for *Pfiesteria* outbreaks has been developed (see Figure 4).

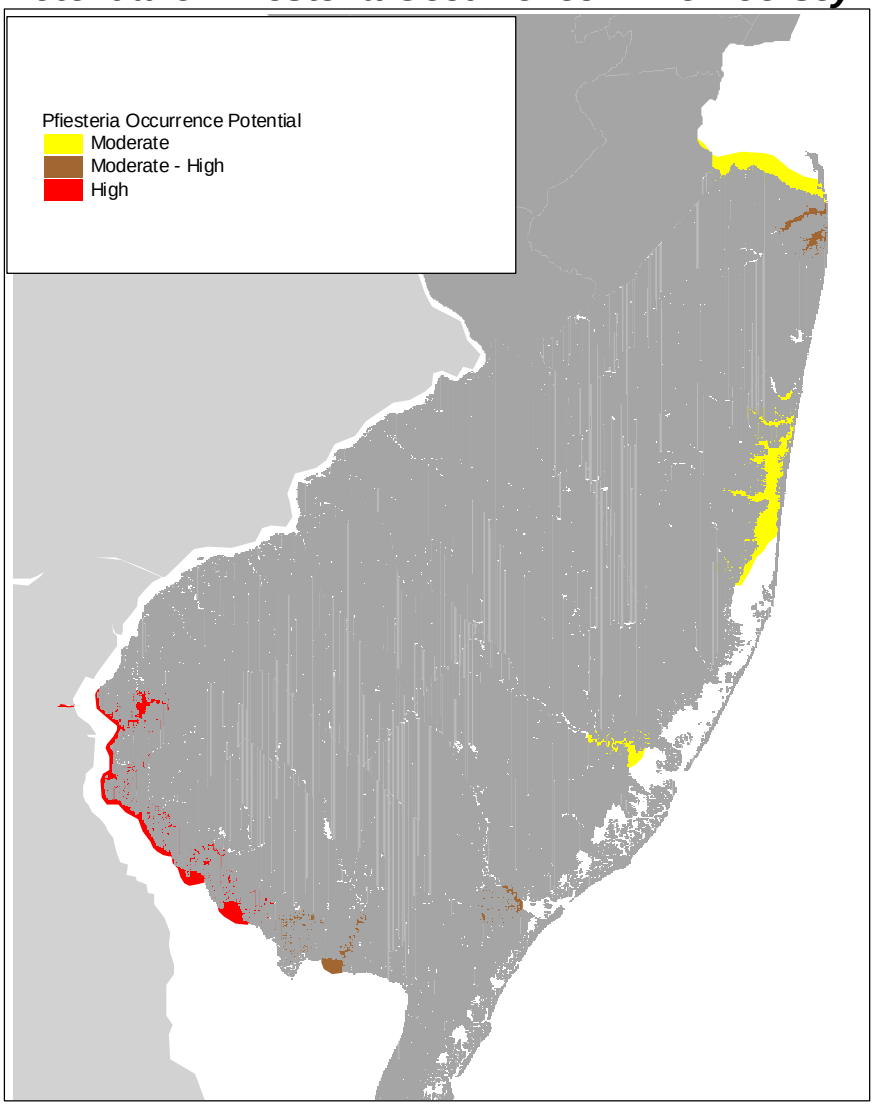
- This estimation of the potential for a *Pfiesteria* outbreak could be used in a variety of ways. For instance, fisheries biologists and public health personnel could be informed of areas of potential concern. Furthermore, if a decision were made to initiate any ambient water monitoring, the information could be used to prioritize sampling.

- Between August and November, 1999, the DEP, Division of Science, Research and Technology collected 38 water and 18 sediment samples from 32 estuarine sites within most of the shaded areas of figure 4. These samples were tested by Dr. Parke Rublee, University of North Carolina at Greensboro, for *Pfiesteria piscicida* and 2 other species, using a DNA-based assay. *Pfiesteria piscicida*-specific DNA was detected at one of the estuary areas. This test cannot tell if live *Pfiesteria* organisms are present, how many are present, or whether or not the organisms are or were toxic. Despite this testing, the geographic distribution of *Pfiesteria* in NJ estuaries has not been adequately characterized. Thus, additional sampling is anticipated. For current information on *Pfiesteria* research in NJ, contact the DEP, Division of Science, Research and Technology, (609) 984-6070.

- In September, 1999, the DEP responded to a report of a fish kill in the Tuckahoe River at Corbin City, Atlantic County. A water sample was collected and submitted to the laboratory of Dr. JoAnn Burkholder, North Carolina State University, for analysis to determine if toxic *Pfiesteria* complex (TPC) organisms were present. Toxic *Pfiesteria* organisms were not found in this sample nor was *Pfiesteria* DNA found in the sample. The day after DEP responded to this fish kill, Tropical Storm Floyd arrived in the region and ended the conditions that contributed to the fish kill. No further action was initiated.

- This contingency plan is a work in progress, subject to change and enhancement as more is learned about *Pfiesteria*, as practical experience with components of the plan is obtained, and as the experiences of the other mid-Atlantic and Southeastern States can be incorporated. The plan has been jointly developed by the DEP (Division of Science, Research and Technology, Division of Fish and Wildlife, Division of Watershed Management, Division of Responsible Party Site Remediation) and the DHSS (Division of Epidemiology, Environmental and Occupational Health) as both a training aid for internal monitoring staff (boat captains, fisheries biologists, ambient monitoring staffs, etc.), and as the blueprint for the State of New Jersey response should a *Pfiesteria*-like fish kill occur in New Jersey. The contingency plan describes criteria for the collection of water samples designed to confirm the presence of *Pfiesteria*, safety protocols for the collection of samples, QA/QC protocols for the collection of the samples, and policies for the closure and opening of coastal waters to primary contact activities (e.g. bathing, waterskiing, etc.) and other recreational activities such as fishing.

Potential of Pfiesteria Occurrence in New Jersey



New Jersey Department of Environmental Protection
Water Monitoring Management

Figure 4

Response To Potential *Pfiesteria* Events

Operational Guidelines and Notification Procedures:

The DEP, Division of Fish & Wildlife (DF&W) will use the following guidelines when presented with a possible *Pfiesteria* caused fish kill:

1. A fish kill should be reported to the toll-free DEP Action Line, (877) WARNDEP, or Trenton Dispatch.

2. A Conservation Officer (CO) or biologist (depending on availability) will go to the scene and make an assessment as to whether or not *Pfiesteria* samples should be collected based on the protocol given in this document. (See next section)

3. The responder will contact Chief, Bureau of Law Enforcement (DF&W) or designee, who in turn will contact both, Administrator, Marine Fisheries Administration and the Bureau of Emergency Response (DRPSR). If the responding CO is equipped with a boat and a sample collection kit, he/she will assume the responsibility for assisting the Emergency Response team, for shipping the samples to North Carolina State University Department of Botany (NCSU) and for the follow-up phone call as prescribed in the protocol below.

4. If the responder does not have a boat and/or sample collection kit, Marine Fisheries will make the necessary arrangements for the transport of a boat (if necessary) and sample containers to the Emergency Response Team at the designated location.

5. If the fish kill has the outward appearance of a *Pfiesteria*-related event, the Emergency Response Coordinator will notify and update the DEP Commissioner's Office and Press Office, and the DHSS Division of Epidemiology, Environmental and Occupational Health.

6. Emergency Response Team members will collect, preserve and label sample containers as prescribed in the protocol.

7. The designated DF&W support staff member will receive the boxed samples, seal and label the shipping containers, affix postage to each sample and send via overnight mail to NCSU as prescribed in the protocol.

8. The individual mailing the samples will then telephone NCSU and advise of the shipment of samples.

Sampling Criteria:

Water samples should be collected from one (1) site within the area of dead or dying fish when one or more of the following criteria are met:

- A large fish kill for which no readily apparent cause, such as low dissolved oxygen, can be identified.
- Fish kill occurs in estuarine or near-shore coastal waters.
- Fish kill takes place over a period of several days.
- Fish kill involves either menhaden or another species traveling in large schools.
- Fish display erratic swimming behavior, sporadic movements, disorientation, and lethargy.
- Fish are exhibiting characteristic lesions, namely shallow, bleeding ulcers of the skin (see Figures 5 and 6). However, since the absence of lesions does not rule out the presence of *Pfiesteria*, failure to observe lesions should not negate the collection of samples. This would be particularly true if large numbers of menhaden, observed to be displaying lethargic or erratic swimming behavior, are dying in the absence of any apparent cause.

Figure 5

Figure 6

It is important to keep in mind that sores and lesions occur naturally at a low frequency every year in all fish communities, and that there are many types of skin abnormalities in fish that are not lesions from *Pfiesteria piscicida.* These abnormalities fall into two major categories:

Abrasions: Abrasions are scrapes, patches of missing scales, or other superficial anomalies. These may be mechanical injuries caused by nets, handling by fishermen, rubbing against other fish or the water bottom, etc.

Other Lesions: Other lesions may take the form of ulcers, swellings, reddening, discoloration and bleeding. *Pfiesteria* toxins are among the known causes for lesions, but are not the only causes. The most typical lesions caused by *Pfiesteria* are often large, round, deep (usually into the muscle), bleeding, and are usually near the anus. It is important to note that even in the presence of *Pfiesteria* toxins, lesions are not always visible to the observer.

Water Sampling Safety Protocol:

DEP-BER SOP FOR *PFIESTERIA* SAMPLING

The DEP Bureau of Emergency Response (BER) of the Division of Responsible Party Site Remediation has entered into an agreement to provide response personnel to work in conjunction with the DF&W for the purpose of obtaining water samples in suspected *Pfiesteria* tainted waters. This sampling will take place on an emergency basis when DF&W personnel suspect a possible *Pfiesteria* toxin exposure. The toxins released by the *Pfiesteria* dinoflagellate have been shown to be dermal and respiratory irritants as well as causes of memory difficulties and behavioral changes. These symptoms have been documented primarily in watermen who are subject to prolonged, repeated exposure to contaminated waters. With respect to these recognized hazards, only properly trained personnel using the appropriate protective equipment should sample known or suspected contaminated waters. BER personnel, who are already trained, fit-tested, medically monitored, and properly equipped, will be able to perform this duty and meet the requirements of the PEOSH respiratory protection standard and the personal protection equipment standards. The following are the standard operating procedures which will be followed for the sampling operation:

1. A team of two Responders will be deployed to a sampling request.

2. The Responders will provide the required Personal Protective Equipment (PPE), Personal Flotation Device, and communications equipment. The BER Responders will have successfully completed the Boaters Safety Course.

3. The DF&W will transport the boat, sampling equipment, and a supply of cleaning water to the sampling site. The boat will have a First aid kit.

4. BER Responders, wearing personal flotation devices and PPE will travel by boat to the sampling site, take the samples, record all pertinent observations, and return to the departure point. The samples will be relinquished to DF&W personnel for eventual lab analysis. Sample locations will be fixed using two separate handheld GPS units or LORAN and coordinates will be recorded.

PPE PROTOCOL FOR *PFIESTERIA* SAMPLING

1. A Personal Flotation Device (Type II PFD Vest/Float Coat) will be worn at all times.

2. PPE will consist of Level C or Level B gear.

   Respiratory: Minimum of full-face respirator with combo cartridges. SCBA/Escape bottle may be used at the discretion of responders, keeping in mind the increased safety hazard of boat work.

   Skin: Minimum of Coated Tyvek or Vinyl Acid Suit, with hood to prevent contact with water or spray.

   Hands: Forearm-length nitrile glove(s).

PPE PROCEDURES DURING *PFIESTERIA* SAMPLING

1. The nature of the *Pfiesteria* toxins requires respiratory and dermal protection, as well as attention to proper contaminant decontamination.

2. Prior to embarking on the boat, responders will don personal floatation device, protective suit, nitrile gloves, and boots. To enhance protection from contaminated water, the suit will be taped at glove and boot junctions. The storm flap on suit will be secured or taped.

3. Boat travel through non-contaminated waters may be made without a respirator or Lance-gloves. When nearing suspected contamination area, respiratory equipment and suit hood will be donned.

4. When transiting suspected contaminated waters the boat will be operated so as to minimize water spray and aerosolization of the toxin.

5. Lance-gloves will be donned and taped for the sampling procedure. The samples will be taken from one foot below the water surface attitude (open, invert, and right under water). The boat will be placed in a secure attitude (zero headway, safe boating procedures) during sampling. The attending responders will act as a safety spotter for the sampling responder, watching for boat wakes, and other hazardous conditions.

6. Subsequent to sampling, the samples will be preserved (when required), closed, wiped down, and secured for transit. Responders will remove outer gloves and contaminated towels, etc. and deposit and secure in a trash bag. Suit areas contacted by contaminated water will be cleaned using water spray.

7. Departure from the contaminated area will be made minimizing water spray. Upon arrival at a dock or in clean water, respirators and hoods may be removed, keeping in mind proper doffing procedures. An extra pair of nitrile gloves should be maintained for handling sample jars or potentially contaminated equipment. All such equipment should be decontaminated at the dock using a bleach/water solution. Disposable PPE and equipment should be bagged for disposal. Respirators should be thoroughly cleaned using the standard respirator decontamination solution. Upon removal from the water, the boat should be decontaminated.

8. Throughout the entire *Pfiesteria* operation, all personnel should maintain a heightened awareness for **heat stress** and take appropriate precautions (fluid intake, rest breaks, emergency cooling). In addition, boating safety techniques become more important due to the use of PPE and taking of samples. Donning of full PPE can be done just prior to entering contaminated area to minimize heat stress; however, if contamination possibility is unknown then a judgement must be made as to when to don personal protection.

BOAT EQUIPMENT LIST FOR *PFIESTERIA* SAMPLING

1. Cooler containing sampling jars, preservative, and other equipment.
2. Lance-gloves, nitrile gloves, duct tape.
3. Sprayer containing bleach/water.
4. First aid kit.
5. Paper towels.
6. Garbage bags.
7. Cell phone and/or radio.
8. Handheld GPS units.

Water Sampling Protocol:

- Water samples are to be collected from one site within the area where dying fish are observed.

- All sampling locations shall be accurately determined using either GPS or LORAN.

- Each water sample is to be collected from approximately one (1) foot below the surface of the water.

- At each collection site, two (2) samples, a preserved and an unpreserved water sample, are to be collected.

  - 500 ml unpreserved sample volumes should be collected in either a plastic or glass container.

  - 250 ml sample volumes preserved with acidic Lugol's solution (a 0.01% solution to roughly a golden-orange color) should be collected in either a plastic or glass container.

- Samplers are to record on the sample record sheets the location, date and time of both the sample collection and the fish kill which prompted the sampling. A copy of the sample sheet is to be kept with the samples during transport to the analytical laboratory.

- All sample containers should be clearly marked with the sample number, the sampling date, the sampling time, and the sampling location.

- On either the sample record sheets or in a sampling log book, record observations of fish behavior, fish appearance, the presence of any external lesions, the species of fish involved in the event, and approximate numbers affected, time and date of the onset of the fish kill, and any other observations thought to be pertinent.

- Samples are to be packaged in a sturdy shipping container with an inner plastic liner[1]. Include the sample record sheet with the samples and the name, address, and phone number of the person to be contacted with the results of analysis.

- Samples are to be shipped, by overnight Express[2] mail, to:

  Dr. JoAnn Burkholder
  Department of Botany
  North Carolina State University
  Box 7612
  Raleigh, N.C. 27695
  and;
  Contact Dr. Burkholder by telephone at (919) 515-2726 or (919) 515-3421 when shipping samples to let her know (usually by a voice-mail message) that samples have been forwarded. If your office has an Internet connection, an e-mail notification can also be made to the NCSU Aquatic Botany Laboratory at the following addresses:

  howard_glasgow@ncsu.edu
  FaganJohns@aol.com

[1] Nalgene® produces a packaging system complete with sample bottle, absorbent material and inner plastic liner. Catalog number 9214-0500 contains a 500 ml sample bottle and catalog number 9214-0250 contains a 250 ml plastic bottle. Each sample can be packaged and shipped separately.

[2] A package containing samples from three (3) sites (three 500 ml unpreserved and three 250 ml preserved samples) should weigh between six (6) and seven (7) pounds.

Protocol for Closing and Reopening Waterways Affected by *Pfiesteria* or *Pfiesteria*-Like Events

Waterways

A Waterway Closure will be Recommended When:

1. A fish kill of a significant nature is confirmed and the affected fish display *Pfiesteria* or *Pfiesteria*-like sores; or
2. A significant number of fish are confirmed to be acting erratically without apparent explanation for the behavior (such as low dissolved O_2) ; or
3. There is evidence of increased *Pfiesteria* or *Pfiesteria*-like activity as reflected by an increase in the number of fish with *Pfiesteria* or *Pfiesteria*-like lesions.

Procedures for Waterway Closure:

1. Based upon the presence of one or more of the above conditions, the DHSS will recommend closure of the affected area to the local or county health authority.
2. The DHSS will consult with and coordinate recommended closure activities with the DEP.
3. Closure boundaries will be determined through visual observations.
4. Waterways that are closed will be visually inspected and assessed for *Pfiesteria* or *Pfiesteria*-like activity.
5. Notification of waterway closures will be posted by the local or county emergency response coordinator to protect the public from possible health complications which may result from direct water contact while the *Pfiesteria* toxin is active.
6. The DHSS will notify the New Jersey State Police Marine Law Enforcement Troop and the US Coast Guard of a waterway closure.

A Waterway will be Recommended for Reopening When:

1. Analytical results of water sampling for toxic *Pfiesteria* or *Pfiesteria*-like organisms are negative; or
2. The conditions that initiated the closure have abated for 14 days.

Procedures for Waterway Reopening:

1. The DHSS will recommend the reopening of the waterway to the local health authority after coordinating this action with the DEP.
2. Notification postings will be removed immediately by the local health authority upon reopening of the waterway.
3. The local health authority will notify the New Jersey Police Marine Law Enforcement Troop and the Coast Guard upon reopening of the waterway.

A Temporary Advisory will be Issued When:

1. A fish kill of a significant nature is confirmed; and
2. The fish involved do not display *Pfiesteria* or *Pfiesteria*-like sores; and
3. No other explanation for the fish kill is apparent. (ex - low dissolved O_2)

Procedures During the Issuance of a Temporary Advisory:

1. A preliminary water analysis for *Pfiesteria* of *Pfiesteria*-like organisms will be done to rule out *Pfiesteria* or *Pfiesteria*-like organisms as a cause of the fish kill.
2. If the preliminary water analysis reveals that the cause is *Pfiesteria* or *Pfiesteria*-like organisms, the DHSS will coordinate the appropriate amendment of the temporary advisory to recommended waterway closure with the DEP. The amended status will be communicated to the local health authority.
3. If the preliminary water analyses reveal that *Pfiesteria* of *Pfiesteria*-like organisms are not the cause, the DHSS will recommend that the advisory be removed.

Comments to Consider:

1. Current knowledge indicates that toxins emitted by *Pfiesteria* and *Pfiesteria*-like organisms break down in less than 48 hours. Investigation is ongoing to identify the nature and activity of the toxins. As new information becomes available this protocol may be amended to reflect current knowledge.
2. The behavior of *Pfiesteria* and *Pfiesteria*-like organisms is seasonal and episodic in nature. Therefore, recommended closures and reopenings may be repeated as necessary.
3. This protocol is subject to continuous evaluation and modification.

Who to Call:

To report fish kills or fish lesions call:

Toll-free NJDEP Action Line
(877) WARNDEP

or,

Regional Offices:
Marine Region - Nacote Creek Research Station: (609) 748 - 2050
(Atlantic, Cape May, Cumberland, Middlesex, Monmouth, Ocean and Salem Counties)
Southern Region: (856) 629 - 0555
(Atlantic, Camden, Cape May, Cumberland, Gloucester and Salem Counties)
Central Region: (609) 259 - 2120
(Burlington, Mercer, Middlesex, Monmouth and Ocean Counties)
Northern Region: (908) 735 - 8240
(Bergen, Essex, Hudson, Union, and non-estuary counties)

or

The New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Marine Fisheries Administration
Mr. Tom McCloy, Acting Administrator
(609) 292-7794

To report possible adverse health effects on persons in contact with fish with lesions or *Pfiesteria* toxin in a waterway call:

The New Jersey Department of Health and Senior Services
Division of Epidemiology, Environmental and Occupational Health
Mr. Ronald S. Ulinsky, Program Manager
Public Health Sanitation and Safety Program
Office: 609-588-3124

or,

Mr. John E. Sharp, Coordinator - Environmental Health Hazards
Public Health Sanitation and Safety Program
Office: 609-588-3124

or,

Mr. James A. Brownlee, M.P.H., Director
Consumer and Environmental Health Services
Office: 609-588-3120

Evening and weekends, please contact the Department's Answering Service at (609) 392-2020 or (609) 888-1900.

Internal Communications

1. DHSS contacts, Messrs. James A. Brownlee, Ronald S.Ulinsky or John E. Sharp, will notify supervisory and subordinate staff members upon receipt of notification of a toxic outbreak, fish lesion or fish kill event.
2. Notification shall be transmitted from the program level to the Office of Commissioner through established organizational channels.
3. Confirmation of events will be conducted by the DHSS, Public Health Sanitation and Safety Program through collaboration with the DEP, local health authorities, laboratories, health care providers, and field observations and interviews, as necessary.

4. Sampling events of the impacted waterway will be conducted cooperatively among the DHSS, DEP and the local health authorities. Analytical results will be evaluated by the DHSS and DEP. Appropriate amendments to the course of action will be issued

based upon sample results and field observations.

5. Upon notification of a *Pfiesteria* event, DHSS will notify regional federal contacts.

Mr. Robert Dieterich
USEPA Region II
290 Broadway
New York, NY 10007-1866
212-637-3794

6. A recommended action plan for sampling, issuance of a temporary advisory and possible waterway closure shall be developed among the DHSS, DEP and the local health authorities.
7. Notification of waterway closure will be issued by the DHSS to:

N J State Police, Troop F
Marine Law Enforcement
Lt. Walter Schwatka
(609) 882-2000 ext. 6171
After hours operator
(609) 882-2000

US Coast Guard
MSO Phildelphia
1 Washington Street
Philadelphia, PA 19147-4395
(215) 271-4992

External Communications, Public Education, Outreach

Upon arriving at a recommended course of action to close a waterway, the DHSS, Public Health Sanitation and Safety Program will inform the local health authorities. Fact sheets will be distributed to the local health authorities as well as health care providers and all health care facilities in the impacted area. Fact sheets will provide information on *Pfiesteria* and the health-related signs and symptoms that have been attributed to the organism. A Fact Sheet entitled "What You Should Know About *Pfiesteria piscicida*", developed by the USEPA, NOAA, USDA, USGS, USDHHS, and the Association of State and Interstate Water Pollution Control Administrators, is available on-line at http://www.epa.gov/owow/estuaries//pfiesteria. A second [draft] Fact Sheet entitled "The Facts on Pfiesteria", by the USEPA and States that are either currently or potentially impacted by *Pfiesteria*, is under development. These fact sheets will be key references in communicating risks to the public.

In cooperation with the DEP, information will be made available to the public through the respective state agency communications office. To obtain information related to *Pfiesteria*, individuals should contact their local health department or access information at the New Jersey Department of Health and Senior Services Web site: **www.state.nj.us/health** .

Epidemiologic Investigation

1. A *Pfiesteria*-Related Illness Report Form will be developed by the DHSS and provided to local health departments and local medical care providers. The form will request

information on basic demographics, signs and symptoms of illness experienced, results of laboratory testing, and exposure to affected waterways.

2. Completed forms will be relayed to the DHSS for compilation and analysis.
3. The need for further studies and analysis will be determined according to results of the preliminary analysis and consultation with *Pfiesteria* medical experts at the Centers for Disease Control and Prevention (CDC) and elsewhere.

Areas of Responsibility (Lead Agencies)

In order to ensure the most efficient and effective use of resources, the following lead agencies and corresponding areas of responsibility are delineated:

- Investigation and monitoring of fish kills suspected to be caused by *Pfiesteria* or *Pfiesteria* - like organisms.....

  NJDEP- Division of Fish and Wildlife

- Evaluation of human health effects and issuance of health advisories, and waterway closures.....

  NJDHSS - Division of Epidemiology, Environmental and Occupational Health

- Communications with the press and general public.....

  NJDEP - Office of Communications
  NJDHSS - Office of Communications

- Explanation and description of ambient water quality leading to potential for *Pfiesteria* outbreaks.....

  NJDEP - Division of Watershed Management - Water Monitoring Management