genetic integrity of Atlantic salmon within the DPS. In addition, concentrations of aquaculture salmon increase the vulnerability of wild stocks to disease. Also, escape of juvenile Atlantic salmon from nearby fish hatcheries may cause a genetic or disease threat to wild salmon.

## E. Other Natural or Manmade Factors Affecting its Continued Existence

Scientific evidence suggests that low natural survival in the marine environment is a major factor contributing to the decline of Atlantic salmon throughout North America. Recent research indicates that major seasonal events influence post-smolt survival of Atlantic salmon. It appears that survival of the North American stock complex of Atlantic salmon is at least partly explained by sea surface water temperature, during the period when Atlantic salmon concentrate in winter months in habitat at the mouth of the Labrador Sea and east of Greenland. Until more direct observation can be made on the marine ecology of post-smolts during the winter, the exact mode of mortality will be unknown. Currently, researchers speculate that a combination of factors related to slow growth and increased predation contribute to marine mortality.

Potential genetic impacts of hatchery practices include inbreeding depression, outbreeding depression and domestication. Potential ecological impacts of hatchery practices include competition and predation, displacement of wild fish, altered migratory and spawning behavior, and disease transfer. The practice of stocking fry transferred from other rivers may have exacerbated the decline of the wild population by displacing wild fish. For six of the seven rivers, the average percentage of the run that was of natural origin (wild) was higher during years not influenced by the stocking of fry transferred from other rivers. However, the Services do not believe that stock transfers in the DPS rivers have eliminated all historic characteristics of wild Atlantic salmon. Although past stocking practices may have contributed to the decline of Atlantic salmon in the seven rivers, the Services are committed to ensuring that future hatchery practices contribute to recovery of each river population. Use of river-specific fry stocking on the Penobscot River has boosted the percentage of natural origin fish and is a tool for recovery of the DPS

In summary, there are basically three major factors which continue to threaten the continued survival of Atlantic salmon within the DPS—poaching, low natural survival of fish during the first winter at sea, and potential impacts from Atlantic salmon aquaculture operations and fish hatcheries to the genetic integrity and disease vulnerability of the DPS.

## Basis for Determination

Section 4(b)(1)(A) of the Act states that determinations required by the Act will be made solely on the basis of the best scientific and commercial data available after conducting a review of the status of the species and after taking into account those efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species, whether by predator control, protection of habitat and food supply, or other conservation practices, within any area under its jurisdiction, or on the high seas. The status of the populations of Atlantic salmon in these seven rivers was analyzed by looking at historic and current angler catch, trap data, and redd counts, all of which are experiencing a downward trend. Then, the escapement goal for each river was calculated by estimating the total number of adults that would be required to fully seed the potential habitat. The documented return to these seven rivers was then compared to the escapement goal to arrive at a comparable measure of the status of the stock. Recent downward trends in abundance have placed all of the rivers at less than 10 percent of their escapement goals, with the exception of the Narraguagus which in recent years has ranged from 6 to 19 percent. The combination of low relative abundance and the low numbers relative to escapement goals indicates that these populations are in peril.

The second step was then to examine efforts currently being undertaken on behalf of the species. There are numerous measures underway to prevent the loss of any of the river populations of Atlantic salmon within the DPS. Collectively, these measures have the potential to reduce the likelihood of extinction and enable the Services to propose listing the DPS as threatened rather than endangered. This designation includes all wild and river specific hatchery stock of DPS origin. For purposes of delisting, the DPS is composed of wild fish and hatcheryreared fish that have returned to spawn naturally and successfully in their river of origin. If these measures are not continued or recent downward trends in abundance are not reversed, then the DPS may reach the point of being in danger of extinction and the designation would have to be changed to

endangered. Actions underway include the following:

1. Continued development of river specific populations for broodstock and stocking in subsequent years. Currently stocks exist for five of the seven rivers at the Craig Brook National Fish Hatchery.

2. Progeny are being outplanted to specific rivers. In 1995, over 100,000 fry will be stocked into the Dennys, Narraguagus, and Machias rivers.

3. The National Biological Service is conducting a comprehensive genetic study of Atlantic salmon populations throughout North America to identify differences in river populations and to compare wild and hatchery stock.

4. In 1993, the West Greenland Commission of the NASCO accepted the West Greenland Fishery Regulatory Measure. This agreement resulted in the setting of quotas with the goal of reaching target spawning escapements for North American stocks.

5. A private-State-Federal task force has been established to make recommendations on how to reduce threats to wild Atlantic salmon posed by nearby aquaculture operations.

6. An intensive study of the population dynamics and the condition of the freshwater habitat of Atlantic salmon in the Narraguagus River is ongoing. Key objectives include the following: estimate the number of adults returning to the river; determine the level of effort necessary to estimate the number of parr; inventory habitat; determine the abundance and diversity of macroinvertebrates; and monitor trends in water quality.

7. NMFS is conducting research on the early marine life history of Atlantic salmon populations in the State of Maine's nearshore and marine waters. The key objective of the study is to better understand the behavior and feeding relationships of post-smolts during their first few weeks at sea.

8. Recent research conducted by the NMFS Northeast Fisheries Science Center in coordination and participation with the International Council for the Exploration of the Seas, indicates that major seasonal events influence postsmolt survival. Additional research is ongoing to identify the processes involved.

9. A number of private land management agencies in Downeast Maine have formed a non-profit entity called Project SHARE (Salmon Habitat and River Enhancement). The group, which includes major forest and agriculture industry representatives, is committed to improving freshwater habitat for the Atlantic salmon in eastern Maine.