EFFECTS OF FISHING REGULATION CHANGES ON LOTIC WILD TROUT POPULATIONS

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Abstract: Effects of liberalized season and the institution of a trophy trout water classification were evaluated at 35 sample stations on 24 trout streams. Trout standing crop significantly increased (0.05 level) at 1 station and significantly decreased at 2 stations. Two stations showed significant increases and 2 stations showed significant decreases in trout abundance. Analyses of pooled data for all streams indicated no significant change. Following the implementation of the 11-month season, trout standing crop increased in 50% of the streams and 71% exhibited an increase in trout abundance. The longer fishing season apparently has had little effect on the lotic population of wild trout. All trophy trout waters showed increased standing crops and abundances with significant increases (0.05 level) in standing crops in 2 streams and a significant increase in abundance in 1 stream. The trophy trout regulation has served to increase the wild trout biomass and abundance.

Proc. Ann. Conf. S.E. Assoc. Fish & Wildl. Agencies 35:654-660

Trout managers realized, as early as 1954, that the greatest problem in wild trout management was the increasing angler demand for a limited supply of wild fish which was declining in some areas to habitat loss (Hazzard 1954). Hazzard (1954) stated "the only alternative is to kill fewer trout and to get more fun from those we take."

Angler interest in fishing for wild trout has been kindled by such national action groups as Trout Unlimited and the Federation of Fly Fishermen (Richardson 1975). A wild trout symposium held at Yellowstone National Park has brought national attention to wild trout management (King 1975). Symposia held in the southeast involving anglers and managers have allowed an exchange of information and provided valuable input into the decision-making process (USDA 1975; Tate 1978). Tate (1978), summarizing the feelings of 1 group of trout fishermen, stated

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that trout fisheries management should establish and maintain wild trout populations through stream classification and stream-by-stream management procedures.

Trout waters in North Carolina are infertile (alkalinity ≤12 ppm, total hardness ≤10 ppm) because of the granite bedrock underlying the region. The streams are elevation dependent to insure water temperatures suitable for trout survival. These streams are small, have a moderate to steep gradient with many ledges and pools and are shaded by dense riparian vegetation.

The North Carolina Wildlife Resources Commission initiated wild trout management by establishing native trout regulations in 1960 (Ratledge 1964) and trophy trout regulations in 1969. Since establishment, these regulations have undergone several changes (Fig. 1). In 1974, the trout fishing season was changed from 5 to 11 months for all native trout streams. The objective of this study was to evaluate what effects the liberalized fishing season and the trophy trout regulation has on lotic populations of wild trout. This study was funded under Federal Aid in Fish Restoration Funds, F-24-S.

METHODS

Prior to 1969, fish population sampling was completed using rotenone, cresol and electrofishing methods. Early electrofishing methods utilized a portable electric seine (Seehorn 1968) powered by a 115 to 230-v, 2.2-amp generator. Rock salt was dispensed to increase the conductivity so that an adequate electrical field could be maintained (Lennon and Parker 1958). Since 1972, all sampling was accomplished using backpack electrofishing gear and rock salt (Mickey 1979). A single pass was made through each sample site and block nets were not utilized.

Sample sites were selected to be indicative of the entire stream. Lengths of sample sites ranged from 80 to 150 m with a mean length of 100 m. Stream widths were measured every 25 m. All fish within the sample site were collected with dip nets. Total length (mm) and weight (g) were recorded for all game fish species. Nongame fish species were counted and weighed.

A 1-factor analysis of variance (ANOVA) was used to compare trout standing crops and abundances before and after initiation of the 11-month season on native trout streams and before and after implementation of trophy trout regulations. If more than 1 sample station were located on a stream, differences in standing crops and abundance at each station and on the pooled data were compared. Significant testing was done at the 0.05 error level (Snedecor and Cochran 1967).

Trout standing crop and abundance estimates from Lost Cove Creek, a trophy trout stream, were compared to estimates (T. Harshbarger, U. S. For. Serv. pers. commun. 1980) obtained by the DeLury method of depletion analysis using a 1-factor ANOVA. The sample stations used for the comparisons were 100 m apart.

RESULTS

Fifty percent of the streams with the 11-month fishing season exhibited an increase in trout standing crop and 71% showed an increase in trout abundance (Fig. 2). Significant differences occurred in mean trout standing crops after the initiation of the 11-month season at the upper station South Toe River, at the pooled samples on Fires Creek and at the Bristol station on Fires Creek (Fig. 2).

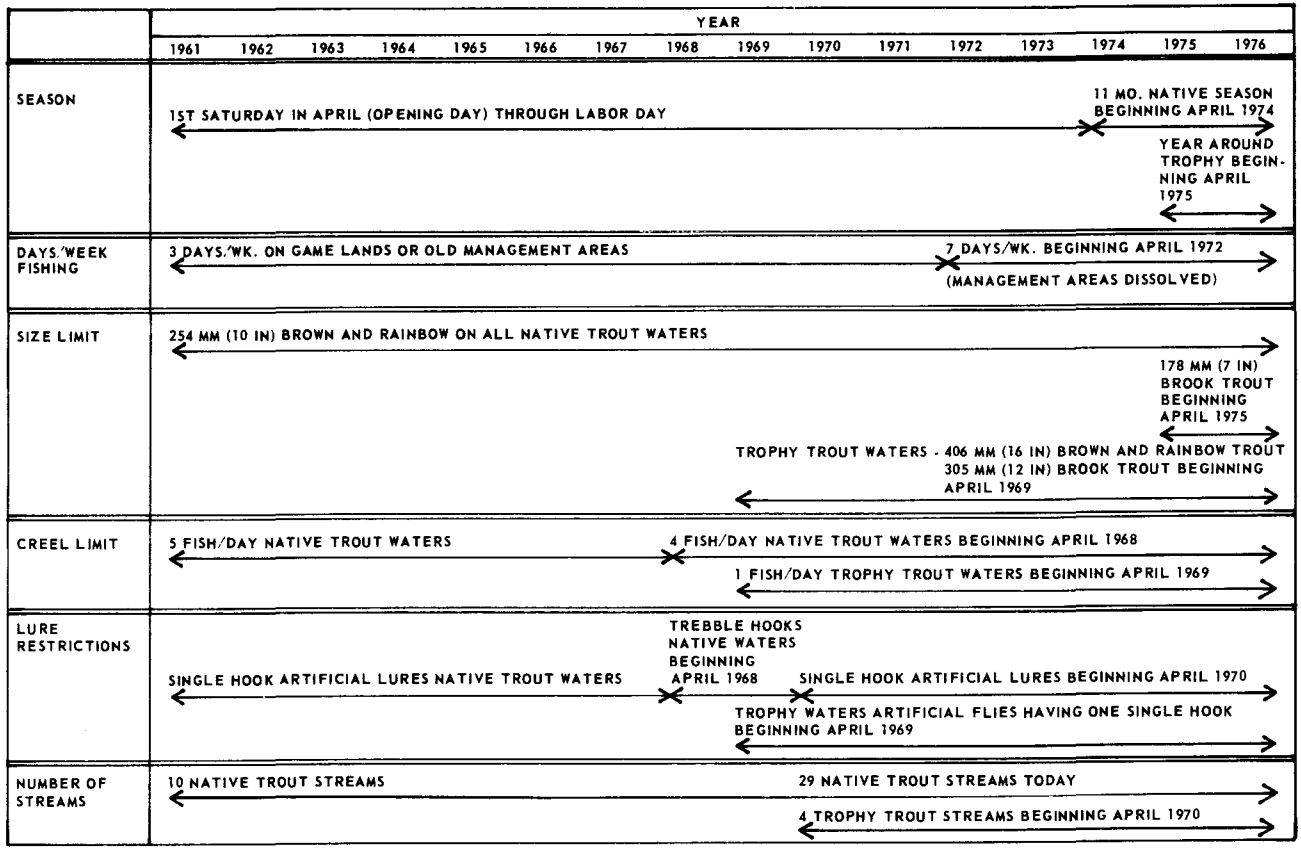

Fig. 1. Summary of regulation changes for native and trophy trout waters.

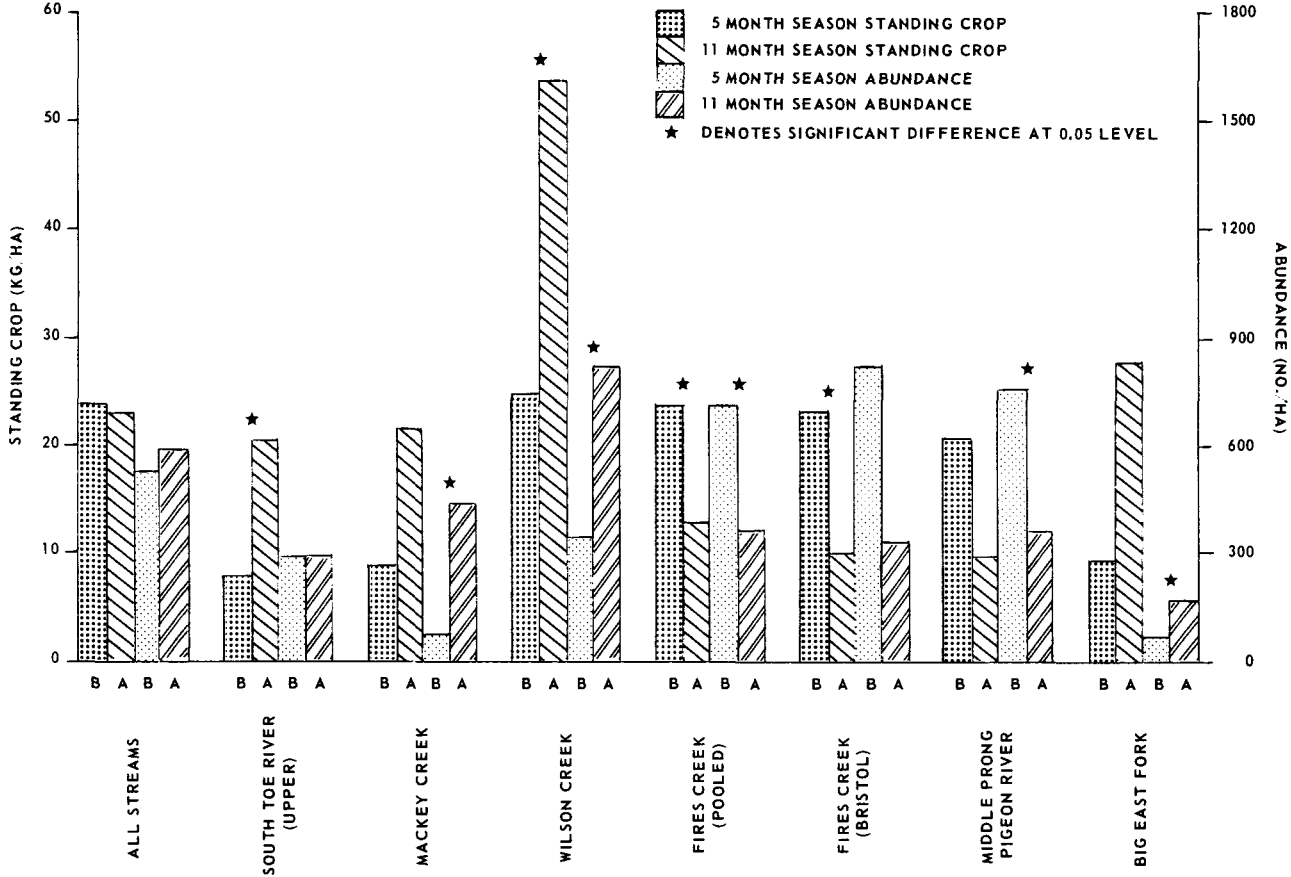

Fig. 2. Mean trout standing crop and abundance before and after an 11 month season.

Trout abundance, after the 11-month season, showed significant differences at Middle Prong Pigeon River, at the pooled samples on Fires Creek, at Big East Fork Pigeon river and at Mackey Creek (Fig. 2). Other sample sites showed insignificant changes in standing crop and abundance. The mean pooled trout standing crop and trout abundance did not significantly change following the implementation of the 11-month season (Fig. 2).

Trout standing crops significantly increased after implementation of trophy trout regulations in Lost Cove Creek and in South Fork Mills River (Fig. 3). Trout abundance significantly increased in Lost Cove Creek (Fig. 3).

There was no significant difference between trout standing crop and abundance in Lost Cove Creek as estimated by the DeLury depletion and single-pass electrofishing methods.

DISCUSSION

Fires Creek was the only stream that exhibited a significant decline in trout standing crop and abundance after implementation of the 11-month fishing season. This decline may have been related to the large increase in the non-salmonid population (2.7 - 30.9 kg/ha). This increase in nonsalmonids may have been enhanced by a major flood in 1972 which appeared to have negatively impacted the trout population (District Files, unpubl.).

A significant increase in trout standing crop at the upper station on the South Toe River appears to be the result of the native trout regulation plus a shift from brook trout (*Salvelinus fontinalis*) to brown trout (*Salmo trutta*) dominance. Brown trout are more difficult to catch which often reduces exploitation and fisherman utilization.

A significant decline in trout abundance on the Middle Prong Pigeon River was influenced by illegal fishing and frequent flooding. A significant increase in trout abundance on Big East Fork Pigeon River was probably influenced by the native trout regulations and designation of the watershed as a wilderness area, which requires an access permit.

A significant increase in trout abundance in Mackey Creek could be attributed to the fact that the upper part of the watershed is utilized as a water supply (fishing is discouraged) and on the lower part landowners have restricted access across their land. These 2 factors apparently have reduced fishing pressure.

Both the reduced harvest afforded by the trophy trout regulation and the excellent water quality of Lost Cove Creek and South Fork Mills River have contributed to the increase in trout standing crops. Wilson Creek is an excellent trout stream where the trophy regulation has enhanced the carry-over of adult trout (Fig. 3). A considerable amount of illegal fishing occurred on this stream which probably functioned as an independent variable and , in turn, influenced the degree of variation in the sample data.

Several streams exhibited relatively large changes in trout abundance and standing crop but considerable yearly variation may have precluded detection of significant changes. Factors such as shifting species composition, excessive siltation, floods, fishing pressure, access, highway construction, logging operations and illegal fishing affect trout populations and have caused discrepancies in the data. These factors have combined to reduce the resource on some streams. Because of

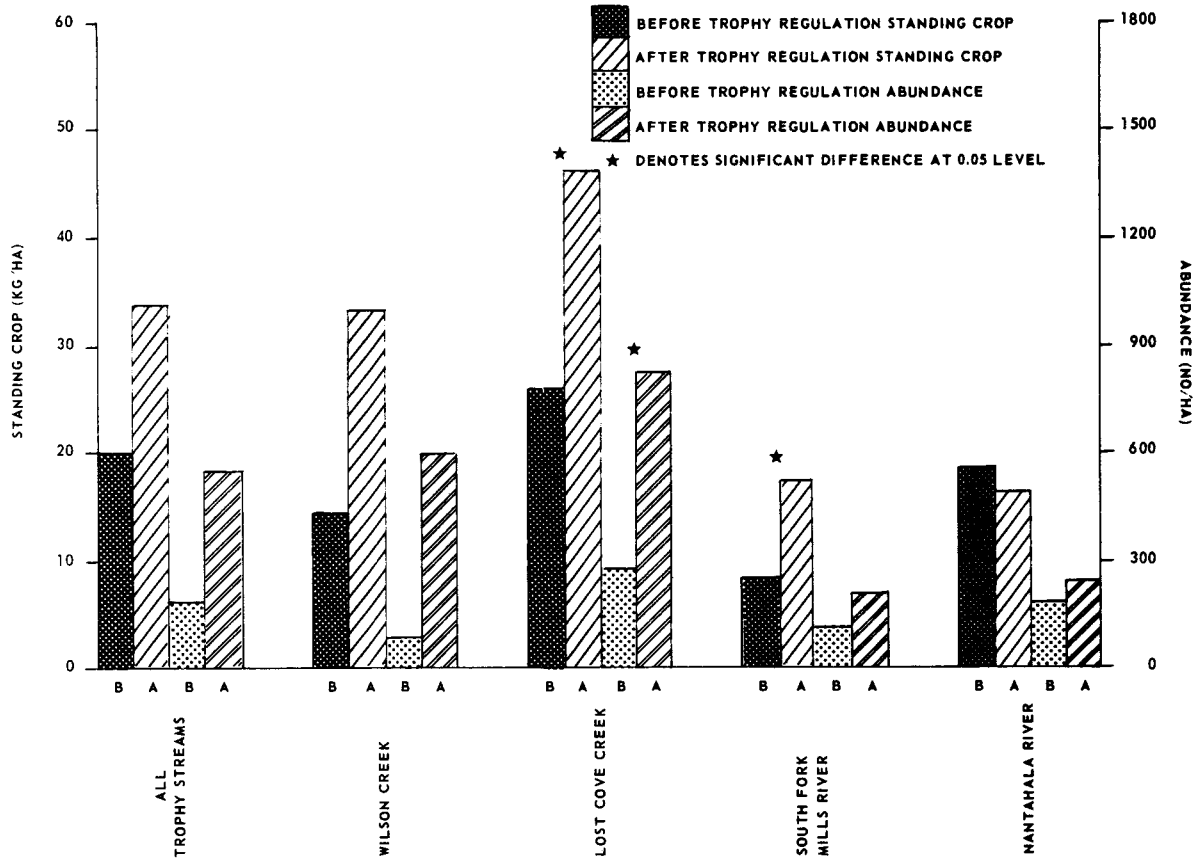

Fig. 3. Mean trout standing crop and abundance before and after implementation of trophy trout regulations.

these variables, any wild trout resource must by monitored to determine if regulation changes, more enforcement and/or better protection of the environment are needed to protect the resource.

Abundance of trout appears to be a more accurate indication of the trout population than the standing crop. This was particularly true when several legal-size trout, captured in a sample, inflated the standing crop but had little effect on abundance. In many cases, uncollected trout were of the larger size classes which may partially account for the large variation in standing crop in different sample years.

Cresol and rotenone were more effective in sampling wild trout populations than the later electrofishing methods. However, the authors feel that the single-pass electrofishing technique provides a reliable indication of changes in standing crop and abundance in wild trout streams in North Carolina. These indications only represent estimates of standing crops and abundances, as fish were often oberved escaping the sample area.

The wild trout resource has not been adversely affected by the liberalized fishing season. With appropriate minimum size limites and enforcement of regulations, the wild trout populations were able to maintain their numbers and standing crops. The trophy trout regulation, with its restrictive creel and size limits and liberalized seasons, has significantly increased the numbers and standing crops of wild trout available to the angler. Undoubtedly, manipulation of fishing seasons is not an affective management tool for enchancing North Carolina trout fisheries.

LITERATURE CITED

Hazzard, A. S. 1954. Problems of trout management. Mich. Dept. Cons., Lansing. Fish Div. Pamphlet 13. 26pp.

King, W., ed. 1975. Wild trout management. Proceedings of the wild trout management symposium at Yellowstone National Park. 25-26 Sep. 1974. Trout Unlimited, Inc. 103pp.

Lennon, R. E., and P. S. Parker. 1958. Applications of salt in electrofishing. U. S. Fish and Wildl. Serv., Spec. Sci. Rep. Fish. 280.

Mickey, J. H. 1979. A dependable backpack electrofishing unit. N. C. Wildl. Res. Comm., Raleigh. Final Rep., Fed. Aid F-24-S. 9pp.

Ratledge, H. M. 1964. Coldwater stream studies. N. C. Wildl. Res. Comm., Raleigh. Annu. Prog. Rep., Fed. Aid F-13-R-4. 11pp.

Richardson, F. R. 1975. Keynote address. Symposium on trout habitat and management proceedings. USDA For. Serv. S.E. For. Exp. Sta., Asheville, 110pp.

Seehorn, M. E. 1968. An inexpensive backpack shocker for one-man use. Proc. Ann. Conf. S.E. Assoc. Game and Fish Comm. 22:516-524.

Snedecor, G. W., and W. G. Cochran. 1967. Statistical methods. Iowa State Univ. Press, Ames.

Tate, H. W., Jr. 1978. Trout management approaches a need in the southern Appalachians. Pages 119 - 121 *in* USDA., ed. Southeastern trout resources: ecology and management symposium proceedings. S. E. For. Exp. Sta., Asheville.

U. S. Dept. Agric. 1975. Symposium on trout habitat and management proceedings. USDA For. Serv. S.E. For. Ext. Sta., Asheville. 110pp.