RAINBOW TROUT MANAGEMENT PLAN

DEPARTMENT OF INLAND FISHERIES AND WILDLIFE
DIVISION OF FISHERIES AND HATCHERIES

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RAINBOW TROUT LIFE HISTORY

Rainbow trout (*Oncorhynchus mykiss*) exhibit both landlocked and anadromous populations called steelhead. The original range of rainbow trout included freshwater habitats and coastal areas of the eastern Pacific Ocean extending from northwestern Mexico up to the southwestern coast of Alaska. Freshwater populations were predominantly located as far inland as the Rocky Mountains; however, rainbow trout are also believed to be native to two drainages east of the Rockies. Rainbow trout are one of the more plastic species of salmonids, which has resulted in a wide range of strains that can vary in physical appearance, habitat requirements, and behavior. Their popularity as a sport and food fish, as well as, the variety of strains available has resulted in human introductions that have greatly expanded their native distribution. Today, rainbow trout are found in suitable habitats throughout North America, and they have been introduced worldwide including Australia, New Zealand, Africa, Asia, and Europe. Life histories can vary among the different strains, but following is a general description that covers most varieties.

Rainbow trout are essentially spring spawners with most native strains spawning from mid-April to the later part of June; however, some natural varieties exhibit spawning behavior as early as March to as late as August. In addition, hatchery manipulation has created domestic strains of rainbow trout that spawn every month of the year. Rainbow trout spawn almost exclusively in streams, they rarely reproduce successfully in lake environments lacking suitable stream habitat. Successful reproduction has also been documented within intermittent tributaries and lake outlets. River-resident rainbow trout generally spawn in headwater areas of the main-stem or smaller tributaries.

Mature rainbow trout, 2-3 years of age or older, may start to ascend spawning tributaries as early as late fall in search of suitable spawning habitat, and spawning behavior generally occurs at water temperatures between 50-60^{o} F. Females locate areas for redd excavation, which typically consist of riffle sections located above larger sized holding pools or tail-outs below pools where water depth, flows, and gravel sizes are appropriate. Females often spawn in several different redds with one or more males. After the spawning event, which is similar to other salmonids, the female moves upstream of the redd and covers it with gravel.

Like most fish species, water temperatures heavily influence the incubation period, but eggs generally hatch in 4-7 weeks. Sac-fry remain in the gravel for up to a week while they absorb their egg sacs, and free-swimming fry begin to feed within 2 weeks of hatching. Fry of river-resident rainbows remain in the stream system, whereas lake-resident rainbow fry may return to their home-lake. Fry may immediately move into the lake environment or they may remain in the stream for 1 to 3 years, depending upon the strain. Juvenile steelhead generally remain in the stream environment for 2-3 years before migrating to sea.

Juvenile and adult rainbow trout are opportunistic feeders that consume a wide variety of food. Aquatic insects are the most common food item consumed, but zooplankton, terrestrial insects, crustaceans, mollusks, amphibians, leeches, and fish can be seasonally or locally important. Fish eggs from other species (i.e. Pacific salmon) are an important food source in the Pacific Northwest and the Great Lakes area. Rainbows, like other salmonids, generally shift their diet from smaller sized food items (i.e. plankton) to larger items as they grow in size. Fish generally do not become an important part of the diet until adult rainbow trout reach approximately 12 inches in length.

Rainbow trout growth is highly variable and depends on many different factors including: location, climate, habitat, population size, strain, and food availability. Rainbows in excess of 42 pounds have been recorded, but most adult fish range from 10-27 inches in length and weigh anywhere from ¾ of pound to 9 pounds. Life expectancy can also vary considerably, but 2-4 years is typical for streams and smaller sized lakes. Anadromous populations or those in larger lakes (i.e. Great Lakes) generally tend to be older and have a life expectancy between 5-8 years.

RAINBOW TROUT MANAGEMENT HISTORY

In Maine, rainbow trout management initially began as a federal stocking program of fry and fingerling trout that were stocked at various locations throughout the State during the late 1930's and early 1940's. Federal stockings were discontinued by the mid 1940's; however, a small number of self-reproducing populations were created from these initial stockings and 1-2 populations still remain today. From the mid 40's to 1968, no Department sponsored stockings of rainbow trout occurred; and management was limited to protecting spawning rainbows within select Kennebec River tributaries by postponing the opening day of the fishing season until June 1. A similar regulation has recently been established on tributaries to the Dead River. Expanding the distribution of rainbow trout during this time period was largely discouraged due to concerns regarding migratory tendencies of stocked rainbow trout, potential competition with native coldwater species, and limited resources.

In 1968, the Department initiated an experimental rainbow trout stocking program to compare their performance to brook trout in terms of growth, holdover ability, summer fishing opportunity, and resistance to competition. This study involved 6 ponds and 1 river, the ponds ranged in size from 17-60 acres and all of them lacked suitable spawning habitat. Evaluations ended in 1973 and a final report was presented to the Division in 1974. Study results were mixed: in some waters rainbows exceeded brook trout performance for one or more of the stated objectives; performance was equal to brook trout for one or more objectives in other waters; and rainbow trout performance was less than expected in a couple situations. However, a review of the study methods and its data, as well as, discussions with staff indicates the study faced several problems, which may have contributed to the ambiguous results. In any case, rainbows demonstrated good growth on several study waters by utilizing a variety of fishes and insects for forage, suggesting they might perform well on moderate sized lakes where salmon production was limited by unreliable supplies of smelt.

Between 1974 and 1978, rainbow trout performance was re-examined on 15 different lakes ranging from 60-1,220 acres in size where salmon returns were limited by forage opportunities. At this time, the Department also enacted a 12-inch minimum length limit for rainbow trout on lakes and ponds due to high catch rates and to be comparable with regulations for salmon. Creel censuses on 6 waters demonstrated that rainbows grew well, but provided low angler returns. This phase of the rainbow trout evaluation also had some problems. One of the more critical problems during both evaluations is that the State had trouble acquiring disease-free eggs from year to year, which resulted in 5 different strains being used throughout the studies. This complicated study results, because biologists were unable to distinguish strain related performance issues. The Department discontinued the rainbow project in 1979, because (1) difficulties associated with acquiring disease-free egg sources; (2) the danger of accidental mixing of rainbows with other coldwater species in the hatchery system leading to an introduction in drainages where they might compete with native salmonids; and (3) they did not strongly meet expectations.

After discontinuation of the rainbow trout stockings there appeared to be sentiment from the angling public to stock rainbows again, particularly in southern Maine, and this public desire seems to have increased over time. Meanwhile, fishery biologists in some regions believed rainbow trout might provide improved angling opportunities in some management situations. In the fall of 1997, the fishery division established a committee to revisit the issue of starting a stocking program for rainbow trout. Based on our knowledge, experiences, scientific literature, and discussions with other states the committee felt rainbow trout might provide some benefits

over our existing trout species, which could benefit Maine anglers. Some potential benefits identified included: better catch rates than brown trout (BNT); greater potential for being caught throughout the day than BNT; better ability to tolerate marginal water quality than brook trout (BKT); longer seasonal availability to the angler than BKT; better tolerance to competition than BKT; better holdover ability than BKT; and more opportunistic feeding behavior than BKT, which might yield better growth. The committee and management also determined that a pilot study was needed before starting a full-fledged stocking program. The premise of the study would be to thoroughly evaluate the relative performance of rainbow trout against both brook trout and brown trout in several Maine waters. Experimental stockings were initiated in the spring of 2001 and formal evaluations began in the winter of 2002. Evaluations on the rainbow stockings will continue until 2006 and results from the pilot study along with public input will determine if a regular stocking program for the species is to be implemented in the future.

PAST MANAGEMENT GOALS AND OBJECTIVES

The long-range goal and management objectives established for rainbow trout in the previous minor sport fisheries plan (1986) were met, and then modified in the 1996 update as specified below.

Goal: Maintain present use opportunity for wild populations and expand fishing opportunity to select waters within those management regions where there is angler support for this fishery.

Objectives: Develop specific performance standards and a hatchery based stocking program to facilitate more intensive management. Management of existing wild populations will consist of preserving habitat and allowing harvest to reach any level permitted under general law regulations.

Anglers continue to utilize existing wild rainbow trout populations, and limited data suggests use may be increasing on some waters (i.e. Androscoggin River). In addition, the Department created a rainbow committee in 1997 and initiated an experimental stocking program in 2001 for evaluating rainbow trout performance. Thus, the goals and objectives established in the 1996 update have been met and the Department has made substantial advances towards expanding opportunities through a State sponsored stocking program.

OPPORTUNITY

In Maine, the current distribution of self-sustaining RBT populations are limited to portions of the Kennebec, Androscoggin, and Dead River drainages (Figure 1). All three of these waters provide principal fisheries for rainbow trout and are the most significant fisheries for the species.

The Kennebec River population is predominantly located in the main-stem and tributaries between the village of The Forks to several miles below Solon Dam, including Wyman Lake (3, 146 acres). This population was originally established from federal stockings that occurred in the late 1930's and early 1940's.

The upper Androscoggin River, primarily from the Maine/New Hampshire border to Bethel, and many of its tributaries support rainbow trout populations. Evidence suggests this population may also have developed as early as the 1940's. However, New Hampshire stockings complicate when and how this population developed, as well as, the significance of wild reproduction.

Natural rainbow trout reproduction has also been documented in a reach of the Dead River and several associated tributaries below the Long Falls Dam on Flagstaff Lake. This population is believed to be the result of escaped trout from a private hatchery located on a nearby tributary, and it is unknown if this population would maintain itself if the hatchery no longer existed. Other self-reproducing populations occurred in the past (i.e. Aroostook River), but these populations eventually disappeared when stocking was discontinued.

In addition to the above populations, the State of New Hampshire stocks a handful of border waters with rainbow trout, three such stockings generate principal fisheries that benefit Maine anglers as follows: Horn P. – Acton (205 acres); Great East Lake – Acton (1,768 acres), and the Wild River in Gilead. Several other Maine waters occasionally receive rainbow trout from NH stockings via drop-downs within drainages that traverse State lines (i.e. Saco R., Ossipee R.), but these generally provide only an occasional opportunity to catch a rainbow trout. In recent years, private organizations have stocked rainbow trout into 2 Maine waters on a consistent basis, the Kennebec R. (below Shawmut) and Megunticook Lake – Camden (1,305 acres), which has created principal fisheries for rainbow trout. A small number of public waters are also periodically stocked with rainbows by private organizations for derbies and other special events, but these limited stockings have not created principal fisheries. Private ponds statewide are stocked by private hatcheries, and anglers sometimes report catching escaped rainbow trout in public waters. Again, these occasional catches do not constitute principal fisheries.

All of the waters with principal rainbow trout fisheries are open to angling during the open water and/or ice fishing seasons. Some of the State's rainbow trout fisheries fall under the "statewide general law" regulations established for rainbow trout; 2 fish bag limit, 12-inch minimum length on lakes/ponds or 6-inch minimum length limit on brooks/streams/rivers. However, several principal rainbow trout fisheries have more restrictive and/or more liberal regulations than the "general law" in terms of season, length/bag limits, and gear restrictions. Access to Maine's rainbow trout waters is generally good. All of the lakes and larger rivers have some form of public access, whereas traditional or permissive trespass is common for smaller rivers and streams.

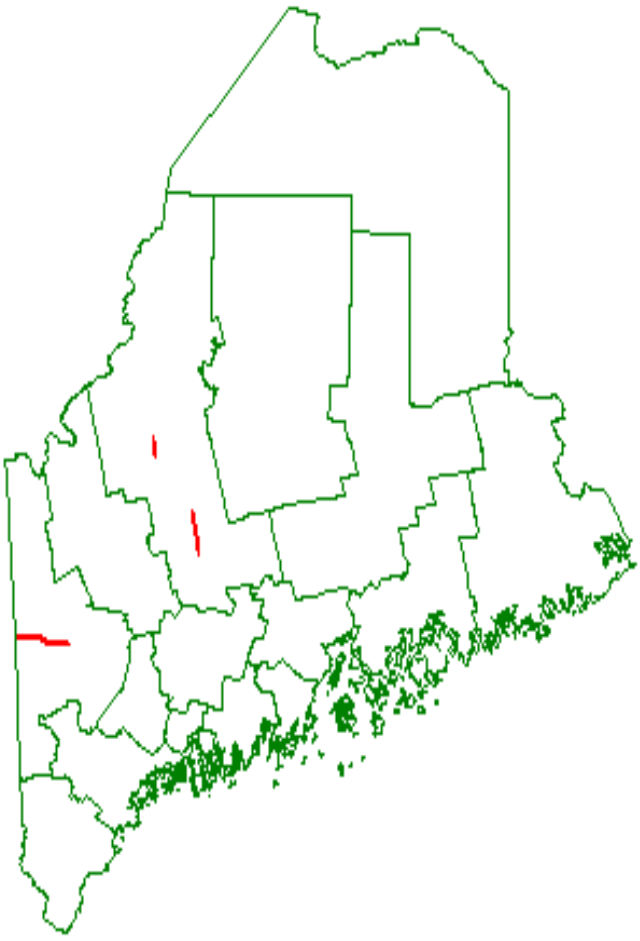

Figure 1. Distribution of Self-reproducing Populations of Rainbow Trout.

DEMAND

The low number of principal fisheries and the lack of a "regular" stocking program limit use and demand information for rainbow trout. However, several recent surveys conducted by the Department and the Sportsman's Alliance of Maine (SAM) suggests anglers want more opportunities for the species. For example, the 1999 Maine Open Water Fishing Survey asked anglers how important the opportunity was to catch various inland fish species, and rainbow trout ranked second Statewide for important/very important responses (Figure 2). In addition, SAM has conducted several polls with questions regarding rainbow trout with the following results:

- 2001 Membership Survey - Should Maine stock rainbow trout in more waters? Yes 65% No 19% (remainder were undecided or did not answer the question);
- 2000 Membership Survey - Should MDIFW add rainbow trout to its hatchery program? Yes 58% No 27%;
- 1998 Membership Survey - If you had to choose, would you prefer rainbow trout or splake? 86%favored rainbows 14% preferred splake.

These survey results are surprising given the lack of a rainbow trout stocking program and the limited opportunities that currently exist to experience a rainbow trout fishery in Maine.

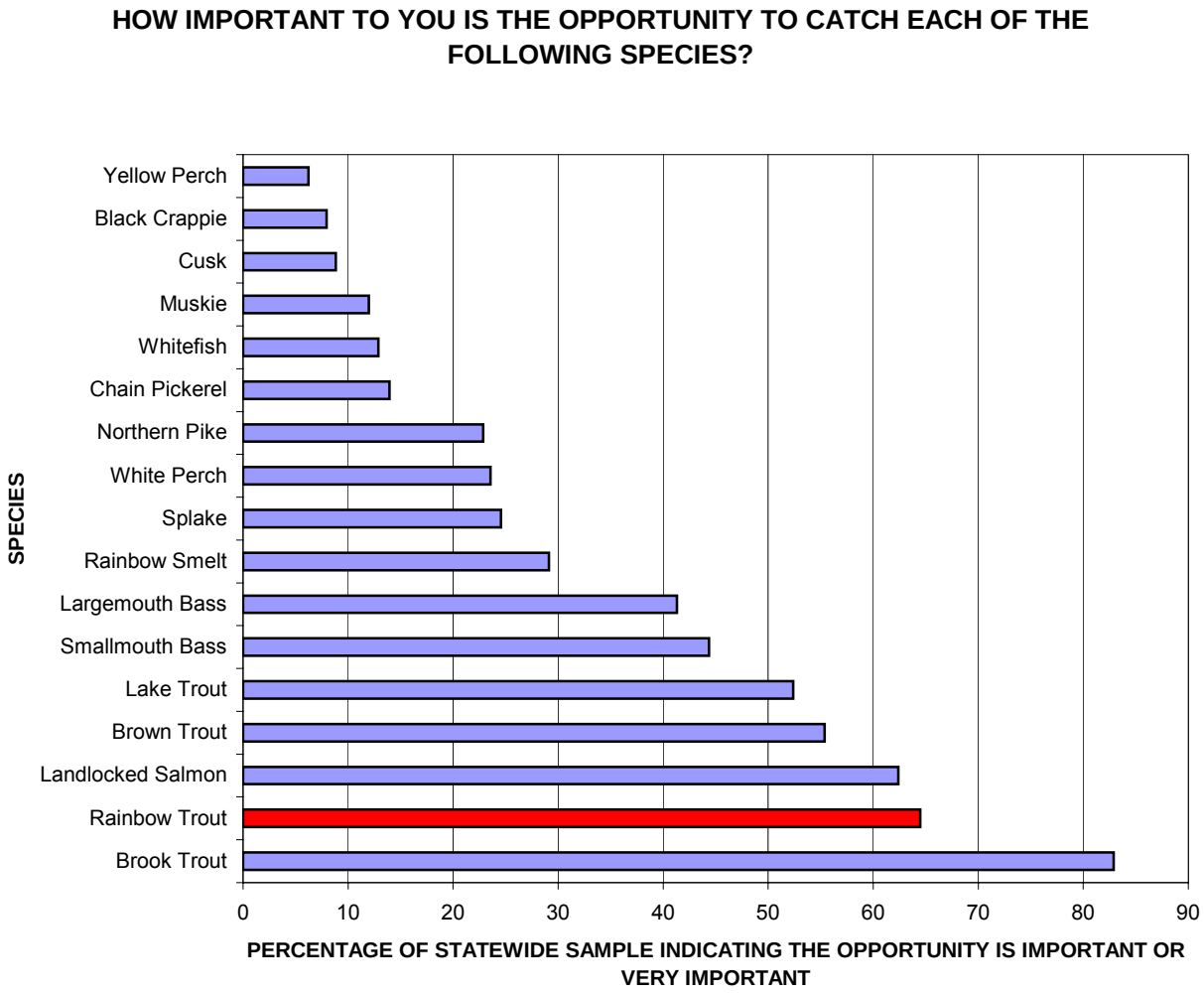

Figure 2. Percentage of Statewide Sample Indicating the Opportunity Catch Various Inland Species as Important or Very Important.

FISHING QUALITY

Again, information to assess the quality of Maine's rainbow trout fisheries is limited by the lack of principal fisheries for the species. However, Table 1 summarizes data from voluntary creel surveys completed on specific rainbow trout waters in Fisheries Management Regions A, B, and D. Rainbow trout catch rates vary considerably from water to water, and the rates presented above are likely to be higher than true catch rates due to biases associated with voluntary data. Mean length data for rainbow trout is more consistent, particularly for the larger river sections. These waters are producing quality-sized trout with an average reported length of approximately 14.2 inches.

Table 1. Summary of Voluntary Fishery Statistics for Principal Rainbow Trout Fisheries, 1996-2000.

WATER	SURVEY TYPE	RBT CATCH RATE[1] (SUB-LEGAL & LEGALS/TRIP)	RBT CATCH RATE[1] (LEGALS/TRIP)	MEAN LENGTH IN INCHES[1] (N)
Upper Androscoggin River	Vol. Book	0.90	0.61	14.0 (26)
Upper Androscoggin River	Vol. Box	0.70	0.41	14.2 (131)
Kennebec River (Bingham)	Vol. Book	0.98	0.30	14.4 (25)
Kennebec River (Solon)	Vol. Book	0.11	0.05	14.4 (4)
Kennebec River (Shawmut)	Vol. Books	0.37	0.07	13.9 (119)[2 3]
Wild River	Vol. Box	0.77	0.61	9.4 (143)[3]

Reported lengths may also be biased towards larger sizes due to the voluntary census methods. The Wild River had a substantially smaller length for rainbow trout, which is probably related to several factors including: water size and habitat, abundance of wild fish, and lower length limit restrictions.

Spring (April) clerk surveys were conducted on a 1.5-mile reach of the Dead River in 1998/1999 to evaluate the rainbow trout fishery and existing regulations. Table 2 provides a summary of fishery statistics from these surveys. This data suggests relatively high spring use for a short stream reach, which is likely partially related to the high size quality of the rainbow fishery.

Table 2. Spring Clerk Survey Results for the Dead River, 1988 and 1989.

Year	Estimated Angler Trips	Catch Rate Legals/Trip	Mean Length In Inches (N)	Mean Weight In Pounds (N)
1998	745 ± 276	0.05	15 ± 0.4 (6)	1.5 ± 0.1 (8)
1999	452 ± 221	0.06	19 ± 1.1 (6)	3.8 ± 0.8 (8)

[1] Data represents combined information from 1996-2000.
[2] Data represents combined information from 1998-2000.
[3] Weighted means.

SUMMARY

Rainbow trout are not native to the State of Maine, and although they have been periodically stocked on an experimental basis there has not been any long-term management or stocking programs for this species. Consequently, the current distribution of rainbow trout is limited to a handful of waters and there are few angling opportunities for the species. Similarly, the amount data collected and analyzed on our rainbow trout fisheries is somewhat restricted for this minor species when compared to our other coldwater fishes.

Despite the limited opportunities, several recent surveys and anecdotal reports suggests that the popularity of existing rainbow fisheries is on the rise and there appears to be an increasing desire for MDIFW to create more opportunities for the species. As a result, MDIFW initiated a small, experimental stocking program for rainbows in the spring of 2001. The premise of the study is evaluate the relative performance of trout against brown trout and brook trout to determine if rainbows have different attributes from the other two trout species that might improve angling opportunities for Maine anglers. The results of the pilot study would then be reviewed by the division with public input to determine the fate of any future stocking program for the species.

RAINBOW TROUT
GOALS & OBJECTIVES

Goal: Maintain present status and use opportunity for wild populations, and expand fishing opportunity to select waters within those management regions where there is angler support for this fishery via the experimental stocking program initiated in 2001.

Objectives:

(1) Management of existing wild populations will consist of preserving habitat and allowing harvest such that it sustains a suitable and viable fishery.
(2) Evaluate the relative performance of rainbow trout, brown trout, and brook trout under the goals and objectives outlined in the rainbow trout study plan to determine the future of any hatchery based stocking programs that facilities expanded opportunities and more intensive management of the species.
(3) Specific performance standards to be determined as needed. Future need for performance standards largely depends on the on the final outcome of the current pilot study and any future expansion of a stocking program.