Robert W. Van Kirk
Alexander V. Zale

PREFACE

The geographic region of the United States that is the focus of this journal, that which most of us know as the "Intermountain West," conjures images of sagebrush-covered plains, foothill grasslands, clear rivers lined with cottonwood forests, and the mountain ranges of the middle and northern Rockies. These images usually are accompanied by ones of abundant wildlife, including the grizzly bear, trumpeter swan and American bison. These and other species, once common throughout large portions of the conterminous United States, exist today in viable populations primarily in the Intermountain West, which contains the largest expanses of relatively undisturbed land in the Lower 48. However, the Intermountain West was settled by Euro-Americans because of its rich natural resources. The traditional economy of the region has been built upon grazing, logging, mining, and irrigated agriculture, the latter of which depends on the most rare of the West's resources, water. The dichotomy of wildness on the one hand, and a natural-resource-based economy on the other, has placed natural resource management squarely in the center of life in the Intermountain West and has led to intense conflict. In the past decade, natural resource management in the Intermountain West has become even more contentious and complex because of a large influx of new residents who have moved into the region precisely because of its wildness and associated opportunities for fishing, hunting, and other outdoor recreation.

Robert W. Van Kirk, Department of Mathematics, Idaho State University, Pocatello, ID 83209
Alexander V. Zale, Montana Cooperative Fishery Research Unit, USGS, Montana State University, Bozeman, MT 59717

However, there has proven to be a positive side to this contentiousness and complexity. New approaches to decades-old natural resource problems have been developed in the Intermountain West, and the most successful of these approaches have involved cooperation, an ecological view based on watersheds, and scientific research. Lying in the heart of the intermountain region is the watershed of the Henry's Fork of the Snake River, which has become a national example of the new cooperative, watershed-based approach to natural resource management. It is therefore fitting that the *Intermountain Journal of Sciences* devote an entire issue to this watershed.

The Henry's Fork watershed contains all the ingredients required for intense conflict over resources, especially those related in some way to water. In 1998 members of the fisheries conservation group Trout Unlimited selected the Henry's Fork as the number-one trout stream in the country, illustrating the reverence anglers have had for the river since its outstanding trout fishing was discovered over a century ago. On the other hand, the watershed also is home to the largest seed-potato production area in the world, and every bit of the seed-potato crop is irrigated with water from the streams of the watershed. Many other aspects of the watershed's geography and history add to the richness of its resources and the complexity of its management. Part of the watershed lies in Yellowstone National Park; another portion is adjacent to Grand Teton National Park. In addition to providing important habitat for grizzly bears and trumpeter swans, the watershed contains one of the largest concentrations of groundwater springs in the world. The Teton subwatershed still contains

widespread and viable populations of Yellowstone cutthroat trout, which have recently been petitioned for listing under the Endangered Species Act. The Teton subwatershed also contains Teton County, Idaho, one of the fastest growing counties in the country, thanks in large part to outstanding skiing and close proximity to the resort town of Jackson, Wyoming.

The early 1990s were a time of particularly intense conflict in the Henry's Fork watershed. The world-famous Henry's Fork rainbow trout population had just bottomed out at the end of a 15-year, 80 percent decline. Years of drought had taken a toll on all aquatic resources in the watershed, just as a committee of citizens and resource managers were struggling to develop a long-term water resource management plan for the basin. Finally, in the summer of 1992, two separate incidents resulted in the introduction of tens of thousands of tons of sediment into the Henry's Fork and one of its major tributaries, Fall River. The Fall River sediment incident occurred in June and was caused by failure of a canal that was being enlarged to carry water to a new hydroelectric power plant. The Henry's Fork event occurred three months later and was caused by reducing the pool in Island Park Reservoir to a low enough volume that the river mobilized sediment that had accumulated on the reservoir bottom. The combination of these and other factors resulted in a severe round of finger-pointing and arguing, which eventually led to the realization among all parties that no conflicts would be solved in this manner. In 1993, the Henry's Fork Foundation, a nonprofit fisheries conservation group, and its prime adversary, the Fremont-Madison Irrigation District, came together to facilitate formation of the Henry's Fork Watershed Council, a grassroots, community forum dedicated to using a nonadversarial approach to solving resource management problems in the watershed. That same year, the Henry's Fork Foundation Board of Directors passed a resolution proclaiming that the Foundation would become a leader in research in the watershed and would gather information on the watershed's aquatic resources so as to enable informed management of those resources.

This issue is the result of six years of intensive research in the Henry's Fork watershed, all of it facilitated in some way by the cooperation and collaboration promoted by the Watershed Council. Most of the papers that appear in this issue resulted from research originally initiated by the Henry's Fork Foundation and its former research staff. Others are the result of agency research initiatives and university research programs. However, all research published in this issue involved collaboration among many different entities and scientific disciplines. The strength of these collaborative relationships is evident in the interrelations among the papers, their multidisciplinary nature, and their emphasis upon providing management-oriented information.

Articles in this special issue are arranged generally in order of increasing ecological complexity. Van Kirk and Benjamin set the stage by describing the geography of the Henry's Fork watershed, including maps that identify locations referred to in subsequent articles. Investigations of subsurface hydrological processes affecting the region's springs, which in turn dictate surface-water characteristics and dynamics, are reported by Benjamin. Simon describes the long-term geomorphic responses of one of these spring-dominated stream systems to the 1988 Yellowstone wildfires. Riparian attributes of both spring-fed channels and runoff-dominated streams in the watershed, particularly plant associations and their ecology, are synthesized by Jankovsky-Jones and Bezzerides. In addition, they discuss obstacles and opportunities for riparian rehabilitation in the region. Bressler and Gregory then report on the effects of

stream habitat and land use on aquatic macroinvertebrate assemblages.

Moving up the evolutionary ladder to vertebrates, Jaeger *et al.* document the current distribution and status of Yellowstone cutthroat trout, the watershed's only native trout. Gregory and Griffith describe results of cage experiments addressing winter survival of cutthroat trout in the presence of non-native brook trout, and Mitro and Zale estimate rainbow trout redd abundances in the Henry's Fork below Island Park Dam. A complete overview of winter fisheries research on the Henry's Fork and related habitat improvements is provided by Gregory. Van Kirk and Martin synthesize the complicated relationships among macrophyte ecology, waterfowl management, flow releases and the rainbow trout fishery below Island Park Dam, and offer integrated management recommendations designed to balance the competing interests.

The final three articles examine the human element of natural resource management and use. Van Kirk and Gamblin chronicle the storied history and folklore of the Henry's Fork fishery and its management, analyze salient incidents and patterns, and propose management strategies and tactics based on the lessons learned from successes and mistakes of the past. Nowell and Kerkvliet estimate the economic value of the Henry's Fork fishery by evaluating how anglers spend their time and money in Island Park. A case study of successful cooperative research and grassroots watershed management, as amply exemplified by the Henry's Fork Watershed Council, is presented by Weber. The special issue concludes with a comprehensive bibliography of articles and reports compiled to identify and make more widely known the available historical and current documents pertaining to aquatic resources of the Henry's Fork watershed.

Many individuals and organizations contributed, both directly and indirectly, to the publication of this issue. Drs. Jack Griffith, Bill Hackett, Jack Longwell, and Garth Voigt, all founding members of the Henry's Fork Foundation Research Committee, deserve special recognition. Their experience in and dedication to scientific research helped shape the research of the Foundation and its collaborators for many years. Many agencies have been key players in Henry's Fork research over the years; Idaho Department of Fish and Game, Targhee National Forest, US Bureau of Reclamation, and US Geological Survey have been particularly involved with data collection and research activities in the watershed and have been outstanding in their cooperation with universities, independent researchers and other agencies. The reviewers of papers in this issue, many of them experienced Henry's Fork researchers in their own right, added immeasurably to the quality of the papers. Susan Steinman at the Henry's Fork Watershed Center in Ashton provided immediate responses to countless queries for bibliographic information contained in the Center's library throughout the revision and editing process. The authors of the papers in this issue deserve a great deal of credit for putting in long, hard hours without compensation to develop research papers worthy of peer-reviewed publication and for putting up with the persistent demands of two editors with very strong opinions about scientific writing. Countless others—student interns, seasonal employees, agency personnel past and present, university faculty members, family and friends—contributed to this issue. We thank all who have made this project possible.

This issue is dedicated to the memory of my grandfather, Joe W. Fleming, who was, like many of us, a scientist and a fisherman. —RVK