Feather River Whitewater Boating Opportunity Feasibility Study

Volume 1: Phase 1 Background Report

Final

Oroville Facilities
FERC Project No. 2100

California Department of Water Resources
Oroville Field Division
FERC License Coordination Branch
Recreation and Land Use Section

February 2009

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State of California
The Resources Agency
Department of Water Resources

FEATHER RIVER WHITEWATER BOATING OPPORTUNITY FEASIBILITY STUDY

VOLUME 1: PHASE 1 BACKGROUND REPORT

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This report was prepared under the direction of

Bill Cochran ..... Supervising Engineer, Oroville Field Division, DWR
Kevin Dossey ..... Senior Engineer, Oroville Field Division, DWR
Mark Andersen ..... Principal Engineer, DWR
Doug Rischbieter ..... Staff Environmental Scientist, DWR
Jim Upholt ..... Senior Engineer, DWR

by

Jim Vogel ..... Sr. Environmental Planner, EDAW, Inc.
Anne Ferguson ..... Environmental Planner, EDAW, Inc.
Peter Jonas ..... GIS Specialist, EDAW Inc.
Chuck Everett ..... Principal, EDAW Inc.

Assisted by

Rudy Calderon ..... Environmental Planner, EDAW, Inc.

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REPORT SUMMARY

Background

This report presents the results of the first of two phases of the Feather River Whitewater Boating Opportunity Feasibility Study. The feasibility study was conducted to implement Section B101 of the Settlement Agreement for Relicensing of the Oroville Facilities, signed March 2006 (DWR 2006). Under the terms specified in Section B101, the Licensee is to conduct and fund a whitewater boating opportunity and recreation feasibility study to assist the Project Supplemental Benefits Fund (SBF) Steering Committee in determining potential existing whitewater recreation opportunities that could potentially be enhanced (referred to in Section B101(b) as "non-park options"), or the feasibility for the construction and operation of a whitewater boating project (referred to in Section B101(b) as "park options") in the project area or region. The results of the study will assist the SBF Steering Committee in determining whether to fund the construction and operation of such a project, or cost share on such a project somewhere in the region, pursuant to their funding criteria.

The purpose of this background report is to compile and present existing data on the supply of and demand for whitewater boating that can be used to identify whitewater boating purposes and markets that could be served by a potential whitewater boating park or enhancement of existing non-park whitewater boating opportunities. An additional purpose of the background report is to compile and present information on a suite of existing instream whitewater parks and existing and proposed artificial channel whitewater parks across the United States that can help guide the formulation of whitewater park concepts for the Project area or region. To meet these purposes, discussions were conducted at the outset of Phase 1 to determine the appropriate scope of the feasibility study.

Related to these purposes, three study objectives were identified for Phase 1 of the study:

1) Determine the necessary content and geographic scope of the study, consistent with the intent of Settlement Agreement (Section B101).
2) Assess the existing supply and existing and future demand for whitewater boating in the Project area and region to help define the market that could potentially be served by enhanced or new whitewater boating opportunities.
3) Gain an understanding of key aspects of the recreational use and operational characteristics of existing and proposed whitewater facilities that could be relevant to and inform the development of potential park concepts for the Project area or region.

Phase 2 of the study will apply the data presented in this report, with additional information compiled and collected during that phase, to identify and evaluate a range

of park and non-park options for enhancing whitewater boating opportunities in the Project area or region.

The methods used to conduct Phase 1 of the study involved collecting, compiling, analyzing, and summarizing data from a number of sources. Data for assessing whitewater boating supply were derived from several popular California whitewater boating guidebooks, and from several whitewater boating organization and paddler resource websites. These sources provided detailed information on the location and characteristics of dozens of whitewater runs on natural rivers throughout the state of California and extending into Northern Nevada.

Data for assessing whitewater boating demand were primarily drawn from national surveys of U.S. residents and boaters conducted by the U.S. Forest Service and boating industry organizations regarding outdoor recreation participation and boating participation. These data sources included historical and current data on whitewater boating participation and boater demographics. A subset of those sources provided future projections of whitewater boating participation. In most instances, the data sources provided multistate regional (e.g., West census region, and Pacific census division), and State of California breakdowns of national survey results. In other instances, new statistical analyses of national data (provide by the U.S. Forest Service) were performed to develop data specific to the Northern California and Northern Nevada region and the State of California. Additional localized information was provided by a whitewater boater focus group survey originally conducted and reported on within Oroville Relicensing Study R-16: Whitewater and River Boating (DWR 2004).

Data for evaluating existing and proposed whitewater parks in the United States were obtained from whitewater park websites, whitewater park feasibility studies and project funding reports, and from a variety of published articles and presentations on whitewater parks that reflect recent growth in the development of and interest in whitewater parks. Attempts were made via telephone calls and email to obtain additional information from whitewater parks, specifically regarding the characteristics of their visitors, as well as the financial characteristics and performance of two artificial channel whitewater parks. A few of these attempts yielded useful information, while most did not.

Whitewater Boating Supply

While only one whitewater park currently exists in the Northern California and Northern Nevada region, more than 140 whitewater boating runs were identified on rivers within the three sub-regions: the Northern Sierra, portions of the Central Sierra, and portions of the Cascades and Coast Ranges within a 3-hour drive of the City of Oroville. (This driving distance was used to approximate the likely market area for a potential whitewater park in the Project area or region.) Northern Sierra river systems that are major tributaries to the Sacramento River, such as the Feather, Yuba, and America

Rivers, as well as the Trinity and Eel Rivers and tributaries in the Cascades and Coast Ranges, supply most of the whitewater boating opportunities. These runs represent a great diversity of opportunities in terms of the difficulty, length, and seasonal availability of the whitewater boating runs. However, certain patterns are evident in the characteristics of available runs, particularly when difficulty and seasonal availability are considered in tandem. There are relatively few runs in the higher difficulty classes available during the summer and fall. Also, easy to moderately difficult runs are less available than more difficult runs in most sub-regions during the spring, fall, and winter.

Whitewater Boating Demand

The primary indicator of whitewater boating demand used for this report is historical, current/recent, and projected participation in whitewater boating and related non-motorized boating activities. Because data specific to whitewater boating are scarce, data were used that addressed the general non-motorized boating activities of kayaking, canoeing, and rafting, only a portion of which occurs on whitewater. The several available government and industry sources of whitewater or non-motorized boating participation were often not in agreement in terms of the number or percentage of people participating in the activities of interest, at the national, regional, or state level. Further, comparison of data across sources was made difficult by the different dates of the studies and the boating definitions used (e.g., some sources used “rafting” while others used “rafting and floating” or “inflatables”; similarly, some sources used simply “kayaking” while others used more specific terms like “freshwater kayaking” or “whitewater kayaking”).

Some tentative conclusions can be drawn from the available data. Among the general non-motorized boating activities of kayaking, canoeing, and rafting, canoeing followed by rafting has the greatest level of participation, with kayaking a distant third. (However, most rafting on whitewater occurs in the context of guided rafting trips led by outfitters, many of whom operate on California rivers. Also, most canoeing occurs in non-whitewater environments.) Participation in whitewater kayaking, the most common form of whitewater activity by those most involved in the sport (unlike rafters, whitewater kayakers most often use their own gear and participate in unguided trips) appears to be in the range of 1 to 2 percent of the general population, both nationally and in California. Although national survey data collected by the U.S. Forest Service as part of its repeating series of outdoor recreation surveys indicate that participation in kayaking, canoeing, and rafting all increased during the second half of the 1990s, paddling industry surveys conducted from the late 1990s to 2005 indicate flat or declining participation in those activities. (One such industry survey did show an increase in kayaking participation, and another showed an increase in canoeing participation). Taking these sources as a whole, it is difficult to definitively identify a trend in whitewater boating participation in the state or region. Nevertheless, a modestly sized but dedicated population of whitewater paddlers does exist in the region, as evidenced

by the use of local whitewater runs and the involvement of the local paddling community in enhancing whitewater boating opportunities in the region.

Existing and Proposed Whitewater Parks

Ten whitewater parks were researched for this report: five existing instream parks, and five artificial channel parks (three existing and two proposed). The existing parks vary considerably in characteristics such as number and length of runs, number of rapids or instream structures, the park setting, and non-boating amenities. The parks are more similar in terms of types of boating allowed (most are open to rafts, and whitewater canoes and kayaks) and difficulty class (most are in the moderate range of difficulty). Some parks allow the new sport of riverboarding, and some allow inflatable kayaks, while others do not.

Within the past few years, two large artificial channel parks have opened in Maryland and North Carolina. These artificial channel parks are large in size and boast numerous special design features (with attendant high construction costs), but both are examples of recirculating loop courses, with water pumped from the bottom to the top of the course, and mechanical means provided to carry boaters from the end of the course back to the start. Non-boating amenities are also important aspects of both instream and artificial channel courses, including ample opportunities for spectators to observe the action on the course, as well as non-boating amenities like trails, climbing walls, and food service.

Anecdotal data suggest that at least some whitewater boaters who have pursued their sport on natural runs, including the most experienced and skilled of paddlers, could be drawn to the predictable conditions, amenities, and convenience that a whitewater park could offer. Further, the design and use patterns of existing parks (and the designs and projected use of proposed parks) suggest that attendance at a potential whitewater park in the Project area or region could be maximized by a facility that:

- Provides good opportunities for spectators to enjoy observing whitewater boating;
- Could host paddling events; and
- Provides whitewater boating participation or observation, integrated with other non-boating oriented recreation opportunities nearby, particularly walking and biking trails.

The cost to design and build the whitewater parks evaluated is as variable as the parks themselves. The least expensive park ($150,000) was created as an add-on to a dam repair project. The most expensive parks were planned and constructed through the collaboration, generally over several years, of numerous local, state, federal, and government and nonprofit agencies. Both the least and the most expensive parks have been built with funds provided by numerous public and private sources. These facts

highlight the long-term collaboration that has characterized most existing parks, and would apply to the proposed parks as well.

Fees for the use of the artificial channel whitewater parks evaluated vary (the public instream parks evaluated do not charge fees for paddlers' use). In general, user fees do not appear to be sufficient to cover the cost of operating the whitewater parks, or the cost of repayment on the debts accrued to design and build the parks. When evaluating the available data, the fact that the two largest parks have only recently opened should be considered; each has completed only a single full operating season or year of operation. Financial performance of the parks may change as the parks mature.

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ACRONYMS

ASCI	Adventure Sports Center International
cfs	cubic feet per second
DPR	California Department of Parks and Recreation
DWR	California Department of Water Resources
FERC	Federal Energy Regulatory Commission
FIBArk	First in Boating on the Arkansas
GIS	geographic information system
GPS	global positioning system
NOAA	National Oceanic and Atmospheric Administration
NSRE	National Survey on Recreation and the Environment
OIF	Outdoor Industry Foundation
PG&E	Pacific Gas and Electric Company
PM&E	Protection, Mitigation and Enhancement (measure)
RSWG	Recreation and Socioeconomic Work Group
RV	recreational vehicle
SBF	Supplemental Benefits Fund
SGMA	Sporting Goods Manufacturers Association
SRG	Strategic Research Group
TVA	Tennessee Valley Authority
USCG	U.S. Coast Guard
USFS	U.S. Forest Service
USNWC	U.S. National Whitewater Center

GLOSSARY

play hole A play hole is a typically stationary feature on a river, in particular a standing wave, where water flows back on itself creating a retentive feature (these are often formed at the bottom of small drops or weirs), or eddy lines (the boundary between slow moving water at the river's edge, and faster water). Kayakers use these locations to perform a variety of "tricks" involving skilled and precise control of the watercraft.

riverboard A short floatation device, similar to body boards used in ocean surf, on which the boarder lies face down. It is usually made of plastic and closed-cell foam, and is equipped with hand grips toward the front. The boarder steers with body lean and with their legs, which trail in the water. Because they are immersed in the water, riverboarders often wear wetsuits, and often wear flippers on their feet to help with steering.

surf wave A dynamic water feature in the river that allows a boater to "surf" their boat in place.

whitewater boating Boating on moving water where the surface becomes turbulent or frothy either by passing over rocks, through a narrow river channel, or down a steeper gradient (Armstead 2003).

whitewater park A whitewater park is a recreational facility using either an augmented natural river (an instream park) or a manmade/constructed channel or channels (an artificial channel park) where whitewater boating activities such as rafting and kayaking take place. While an instream park is created within a designated segment of a river or stream that has whitewater run qualities (i.e., rapids), an artificial channel park is created with the construction of specially designed channels within which flow-directing structures are installed to create rapids. These parks often include areas for spectators to watch the boaters, and the land adjacent to the whitewater park may be improved to include trails, parks supporting non-boating activities, and a variety of food, retail, and equipment rental services.

whitewater run A segment of natural river or stream with sufficient gradient, channel characteristics, and flow to provide whitewater boating opportunities. The upstream and downstream extent of the run is generally determined by the put-in and take-out locations used by boaters for the run, although some portions of the waterway between those points may not provide whitewater conditions (e.g., low gradient and/or low flow).

1.0 INTRODUCTION

This study was conducted to implement Section B101 of the Settlement Agreement for Relicensing of the Oroville Facilities, signed March 2006 (DWR 2006). Under the terms specified in Section B101, the Licensee is to conduct and fund a whitewater boating opportunity and recreation feasibility study to assist the Project Supplemental Benefits Fund (SBF) Steering Committee in determining whether existing whitewater recreation opportunities could potentially be enhanced (referred to in Section B101(b) as "non-park options"), or the feasibility of the construction and operation of a whitewater boating project (referred to in Section B101(b) as "park options") in the project area or region. The results of this study will assist the SBF Steering Committee in determining whether to fund the construction and operation of such a project, or cost-share on such a project somewhere in the region, pursuant to their funding criteria.

1.1 BACKGROUND INFORMATION

Community interest in exploring the potential for development of a whitewater boating facility in the vicinity of Oroville emerged during the Federal Energy Regulatory Commission (FERC) relicensing process, which was initiated by the California Department of Water Resources (DWR) in 2000. The Recreation and Socioeconomic Work Group (RSWG) functioned within the Oroville Facilities Relicensing Collaborative for several years and, as part of its activities, discussed potential Protection, Mitigation, and Enhancement (PM&E) measures submitted for consideration by members of the collaborative. The City of Oroville and the Oroville Redevelopment Agency submitted a Resource Action (PM&E) Identification Form for a whitewater park to be located in Oroville on the west side of the Fish Barrier Pool, between the Thermalito Diversion Dam and the Fish Barrier Dam. This conceptual design was described in some detail, and several alternative whitewater facilities at other sites in the Oroville vicinity were also briefly described. The form also highlighted the proponents' objectives associated with the proposed facility, which included making Oroville a destination for whitewater paddlers and adventure sport enthusiasts, and enhancing the local economy, a goal consistent with resource goals established by the RSWG for the Oroville Facilities Relicensing.

The RSWG and DWR determined that this Resource Action was outside the scope of DWR's relicensing or operational obligations, and thus better addressed outside the realm of the FERC license. As a result, evaluation of the feasibility of a whitewater park in the Oroville region was addressed within Appendix B of the Settlement Agreement, as described above. (Appendix B includes measures agreed to among the parties to the Settlement Agreement, but that are to be implemented outside the FERC boundary, or are without a direct nexus to the Project, and therefore are not to be included in the new Project license.)

More recently, DWR has conducted a Reconnaissance Study of Potential Future Facility Modifications. The local whitewater boating community has expressed interest in also

evaluating the potential for the facility modifications described in the Reconnaissance Study to support whitewater boating facilities or use.

As described in more detail in Section 2.0, this study is being conducted in two phases. Phase 1 (this report) includes an assessment of whitewater supply and demand, as well as a compilation of information about existing and proposed parks in the United States. Phase 2 will include an evaluation and comparison of whitewater park concepts and potential sites to implement in the Project area or region.

1.2 STUDY AREA

The scoping process for this study defined the geographic scope of the study as the Project area or region (Section B101 defined the region as "Northern California, Northern Nevada, other nearby western states, or other appropriate analogs if possible"). However, different geographic scopes are necessary to best address the tasks contained in each phase of the study.

For the demand and supply assessments as presented in this Phase 1 report, the study area is regional in scope, focusing on Northern California and Northern Nevada. For the Phase 2 study, the study area will encompass a more limited geographic region, containing and surrounding the Oroville facilities. This geographic scope relates primarily to evaluating and reviewing potential whitewater boating facilities and sites.

Demand for whitewater boating activities (primarily kayaking and rafting) is addressed in the larger geographic context of Northern California and Northern Nevada, to approximate the potential market area for enhanced or new whitewater boating opportunities in the Project area or region. Because demand-related information specific to Northern California and Northern Nevada is not abundant, additional information related to demand at the state, multi-state regional, and national level is also reviewed for general indications that the data might contain relative to the more local area of interest.

To address supply in the context of alternatives available to boaters who reside within the potential market area, the existing supply of whitewater opportunities focuses on Northern California and Northern Nevada. Given the low number of developed whitewater boating facilities in the region as defined in Section B101 of the Settlement Agreement, review of constructed and proposed whitewater boating facilities was extended to include other Western states and other parts of the country.

The available data for regional whitewater demand more specifically relate to western, rather than northern, Nevada. However, western Nevada includes the cities of Reno, Sparks, and Carson City and encompasses most of the population of northern Nevada. Related to supply, western Nevada also contains the only whitewater boating opportunities in northern Nevada – a natural run and a whitewater park, both on the

Truckee River – that are within the potential market area for a whitewater facility in the Project area or region.

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2.0 STUDY PHASES AND OBJECTIVES

The Study Plan for the Feather River Whitewater Boating Opportunity Feasibility Study (Appendix F) describes a two-phase approach to this assessment. Phase 1 is focused on development of the study scope; collecting, compiling, and analyzing information on supply of and demand for whitewater boating opportunities in Northern California and Northern Nevada; and collecting and compiling information on representative existing and proposed whitewater parks in the United States.

All of the information gathering within Phase 1 is intended to meet information needs prerequisite to Phase 2 tasks. Phase 2 is focused on identifying viable potential park and non-park concepts and resulting potential sites for a whitewater boating facility in the Project area or region, and determining the general feasibility of those options.

Three study objectives were identified for Phase 1 of the study:

1. Determine the necessary content and geographic scope of the study, consistent with the intent of Settlement Agreement (Section B101).
2. Assess the existing supply and existing and future demand for whitewater boating in the Project area and region to help define the market that could potentially be served by enhanced or new whitewater boating opportunities.
3. Gain an understanding of key aspects of the recreational use and operational characteristics of existing and proposed whitewater facilities that could be relevant to and inform the development of potential park concepts for the Project area or region.

The information gathered during Phase 1, along with additional, generally more site-specific information to be gathered during Phase 2 itself, will both contribute toward meeting the overall objective of this study: to determine the feasibility of potentially constructing and operating whitewater boating (park and non-park) facilities and/or cost sharing such a project in the Project area or region.

Specific Phase 2 objectives to achieve this purpose are to:

1. Identify three to five viable whitewater park concepts, and viable sites that could accommodate those concepts, in the Project area or region.
2. Identify three to five viable non-park concepts in the Project area or region (sites would be inherent in the concepts, each to be associated with existing whitewater runs).
3. Evaluate and compare the three to five viable park and non-park concepts and provide conclusions regarding the feasibility of constructing and operating whitewater boating (park or non-park) facilities in the Project area or region.

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3.0 METHODOLOGY

Scoping for this study extended over about an 18-month period, and included input from and meeting with both stakeholders and DWR. Information for this study has been gathered from several sources, including the internet, whitewater guide books, nationwide surveys, statewide surveys, and paddle sport industry studies. Sections 3.2 through 3.4 describe the sources used for the assessments included in Section 4.0.

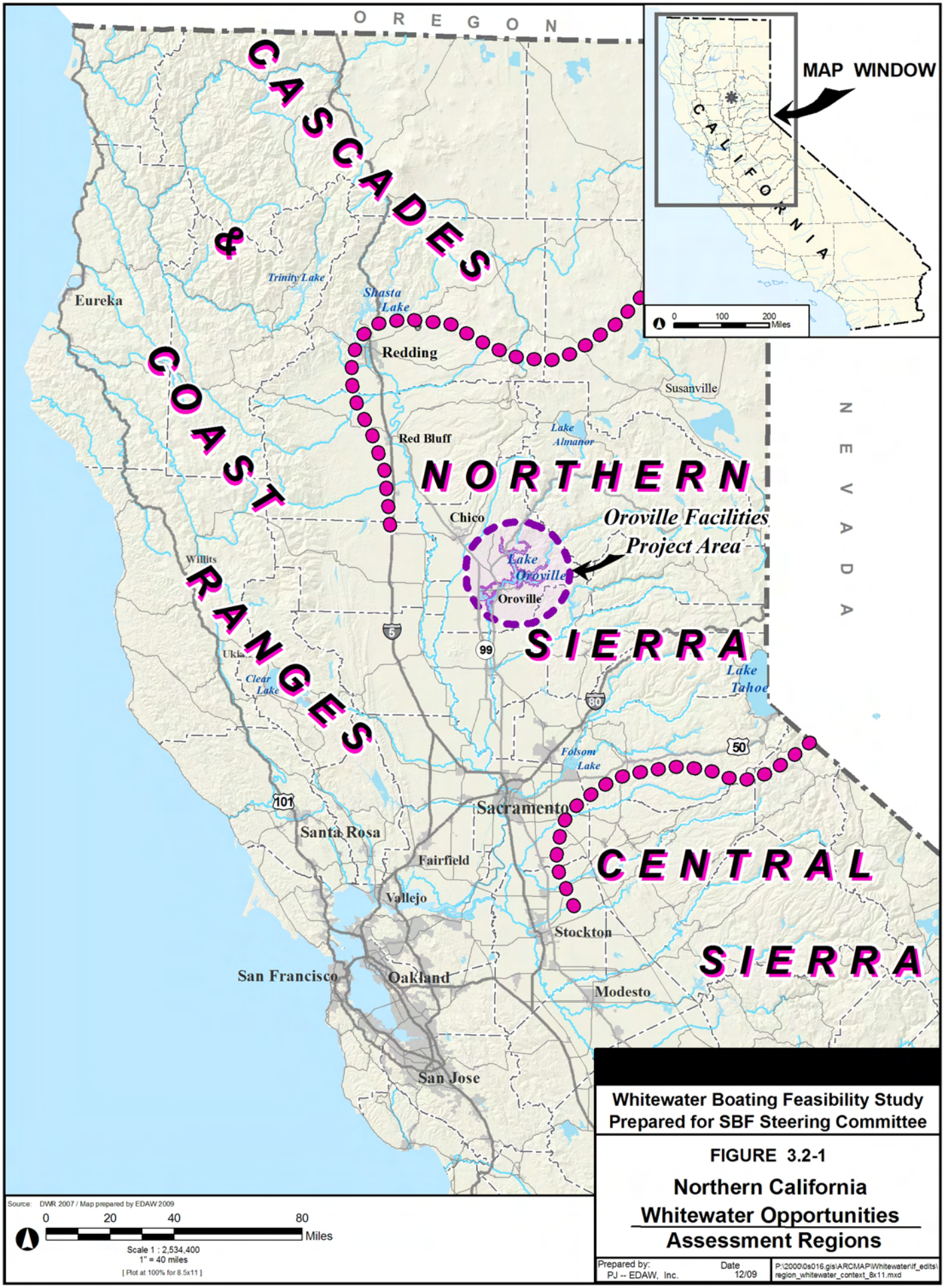
3.1 STUDY SCOPING

Beginning in summer 2006 and extending through early 2007, a series of Scope of Work documents was developed and revised based on review and comments from stakeholders advising the SBF Steering Committee and DWR. Subsequently, a series of draft Study Plans was developed, with the January 2007 Scope of Work as the initial guide for the Study Plan. Draft versions of the Study Plan were reviewed by DWR and revised based on comments and discussion through July 2008, when a final Study Plan was provided to DWR. The final Study Plan was shared with the SBF Steering Committee in September 2008. Members of the SBF Steering Committee commented on the Study Plan, but no substantial changes were required in response to comments.

3.2 ASSESSMENT OF EXISTING SUPPLY OF WHITEWATER BOATING OPPORTUNITIES IN THE REGION

This assessment provides information on the current supply of whitewater boating opportunities in the region that may serve as substitutes for potential opportunities in the Project area or region. The assessment of supply is based on a review of existing and proposed non-park whitewater boating opportunities within the portions of the Northern and Central Sierra and Northern Coastal Mountain areas in Northern California and Northern Nevada, within about a 3-hour drive from the Project area (see Figure 3.2-1). A 3-hour driving distance is the longest estimated trip length that most whitewater boaters would take to get to a run. (In addition, whitewater park developers have stated that a 3-hour drive is “the magic number” in that it represents what they believe to be the maximum distance from which a park will draw users [Vogel 2007].) As such, this area also defines the region likely to contain substitutes for opportunities in the Project area and surrounding communities. Only one whitewater park currently exists in the region; that facility is addressed in another portion of the report (see Section 3.4).

Primary sources used for this assessment include widely available printed sources, such as whitewater boating guidebooks, and internet whitewater boating guides. A list of existing whitewater boating runs within the Northern California and Northern Nevada region was compiled using two guidebooks that are recognized as being comprehensive sources of information on whitewater boating within California, *California Whitewater* (Cassady & Calhoun 1995), and *The Best Whitewater in California* (Holbek & Stanley 1998).



Whitewater Boating Feasibility Study
Prepared for SBF Steering Committee

FIGURE 3.2-1

Northern California Whitewater Opportunities Assessment Regions

Prepared by:	Date	
PJ -- EDAW, Inc.	12/09	P:\2000\0s016.gis\ARCMAP\Whitewater\lf_edits\region_whitewater_context_8x11.mxd

A website created by whitewater users, California Creeks (Tuthill et al. 2008), the American Whitewater organization's California Rivers webpage, and Dreamflows Online Guidebooks webpage (Shackleton 2007) were also used. To fill in information for a few runs, the Mokelumne River Whitewater Recreation Use Study Technical Report (EA Engineering, Science, and Technology 1993) was used. Data regarding the difficulty class, location, and seasons of use/availability were collected for each run.

From the above-listed sources, a database was compiled of whitewater boating runs within the Northern California and Northern Nevada region. The database was then subdivided based on the location of the runs within three geographical regions — the Northern Sierra, the Cascades and Coast Range, and the Central Sierra — and a list of runs was compiled for each region. Whitewater runs located on rivers and creeks beyond the estimated 3-hour driving distance area were disregarded. To map the identified runs in each region, a database was developed from an existing geographic information system (GIS) database of hydrologic features in California. Relevant segments of river were extracted and attributed, with basic river run characteristics obtained from the previously listed print and internet sources, including run name, seasonality, difficulty class range, and difficulty class at optimum flow. Run lengths were calculated and recorded in the GIS database (run lengths provided by print and internet sources served as a check for the GIS calculations).

An overview of the runs compiled for the study area is included in Section 4.2, and a detailed comparative assessment of run characteristics by region is found in Appendix A based on the factors of difficulty class, run length, and seasonality.

3.3 ASSESSMENT OF WHITEWATER BOATING DEMAND IN THE REGION

A range of sources was used to estimate the existing and potential future demand for whitewater boating in the Project area and surrounding region. Several aspects of whitewater boating demand were analyzed, including existing use and participation, user demographics, and trends in both participation and demographics. In general, nationwide surveys provided a substantial portion of the demand information; however, these surveys also provided multi-state, regional, and state-level information drawn from subsets of the national data. Several other sources were compiled to attempt to characterize whitewater boating demand within California and, if possible, at a sub-state level (e.g., Northern California or, more specifically, the region surrounding the Oroville Facilities). Data on the use of whitewater runs on the North Fork Feather River (the existing runs closest to the Oroville Facilities) in recent years supplied an indicator of local demand.

The existing demand assessment focused on current national and western regional participation in non-motorized boating activities and unmet demand for non-motorized boating in California. The assessment of potential future demand focused on national and western regional trends in non-motorized and, where available, whitewater boating participation and estimated future whitewater boating participation within Butte County.

Additional demand factors assessed include the preferences of local whitewater boaters related to a potential whitewater boating facility, such as preferred class level (difficulty rating) of run, boating purposes served, and desired facility features and amenities. The expected characteristics of users of a potential whitewater boating facility in the Project area or region were outlined based on the characteristics of users of existing facilities in the United States (see Section 3.4) and non-motorized boater demographic data drawn from the same national and regional sources that provided non-motorized boating participation data.

The following sections describe the sources used within the individual parts of the demand assessment. Results of the assessment are provided in Section 4.3.

3.3.1 National, Western Region, State, and Sub-State Level Whitewater Boating Participation, Demographics, and Trends

Information regarding participation and trends in whitewater boating was derived from several sources that provide data at national, regional, state, and sub-state levels. Many of these sources do not distinguish between whitewater and non-whitewater kayaking, canoeing, and rafting. Therefore, participation and demographic trend information was based on the non-motorized, generally paddle-powered activities of rafting, canoeing, and kayaking as substitutes for specific whitewater boating information when that information was not available. Table 3.3-1 summarizes the sources of non-motorized boating participation data.

A primary source for data on non-powered boating participation, demographics, and trends was *Outdoor Recreation for 21st Century America* by Cordell et al. (2004), which presents data from the National Survey on Recreation and the Environment (NSRE). Cordell et al. (2004) and the NSRE source data provided nationwide and multi-state census region data on all three boating activities with some specific freshwater boating activity and Pacific census division data available. (The Pacific census division is a 5-state subset of the 11-state West census region, comprised of California, Oregon, and Washington along with Alaska and Hawaii.) Limited information from the 1960s and 1980s were available to identify longer term trends. Most data in Cordell et al. 2004 were from the 1994-95 and 2000-01 NSRE surveys and represent useful, if somewhat dated, information on boating participation and boater demographics, as well as useful indicators of shorter term boating activity trends. The NSRE 1994-95 survey included questions regarding whitewater canoeing and kayaking, thus providing data specifically on whitewater boating participation.

An additional key NSRE-derived source is the U.S. Forest Service (USFS) *Recreation and Tourism Statistics Update* report series (2006a). These reports update the statistics provided in Cordell et al. (2004), and provide NSRE results for USFS regions (USFS Region 5 includes California, Hawaii, Guam, and other island territories), as well as for individual national forests.

Table 3.3-1. Summary of non-motorized boating participation data sources.

Source	Years for Which Data are Available	Types of Non-Motorized Boating Addressed	Geographic Coverage of Data
National Survey on Recreation and the Environment (NSRE):			
Cordell et al. (2004)	1994-95, 2000-01[(a)]	kayaking, canoeing, rafting (1994-95); freshwater kayaking; freshwater canoeing, freshwater rafting (2000-01)	USA, West census region (11 western states + Alaska and Hawaii); Pacific census division (3 west coast states + Alaska and Hawaii)
USFS Update Report - Region 5 (2006a)	2000-04[(a)]	kayaking, canoeing, rafting	California, Hawaii, Pacific Island territories[(b)]
USFS Update Report - Plumas National Forest (2006c)	2000-04[(a)]	kayaking, canoeing, rafting	20 Northern California and 5 Western Nevada counties
USFS Update Report - Tahoe National Forest (2006b)	2000-04[(a)]	kayaking, canoeing, rafting	22 Northern California and 5 Western Nevada counties
Strategic Research Group/U.S. Coast Guard (Strategic Research Group 2003a, 2003b)	2002	whitewater kayaking, whitewater canoeing, whitewater use of inflatables[(c)]	California
Outdoor Industry Foundation (OIF 2006)	1998-2005[(d)]	whitewater kayaking[(e)], canoeing, rafting	USA, West census region (11 western states + Alaska and Hawaii)
Sporting Goods Manufacturers Association (SGMA 2006)	1998, 2000, 2004, 2005	kayaking, canoeing, rafting	USA
California Department of Parks and Recreation (DPR 2003)	2002	paddle sports (combines kayaking, canoeing, rafting and rowing)	California
PG&E (2007)	2006-2050	canoeing, rafting/floating	Butte County

Source: Prepared by EDAW 2008.

(a) NSRE data contained in these sources were collected over a multi-year period. The data are not presented in relation to individual years but for the multi-year samples as a whole.

(b) Although USFS Region 5 includes Hawaii, Guam, and other Pacific island territories, 97% of the region's population is within California. The NSRE sample reflected this population balance.

(c) The SRG/USCG survey asked owners of kayaks, canoes, and inflatables (including rafts) if they participated in whitewater sports in the type of watercraft.

(d) Kayaking data available for 2001 to 2005 only.

(e) OIF survey addressed three types of kayaking separately (whitewater, touring/sea, and recreation/sit on top). The sample was too small to provide regional data for whitewater kayaking.

Another primary source of data on participation, demographics, and trends was the Outdoor Recreation Participation Study (8th Edition, 2006), published by the Outdoor Industry Foundation (OIF). National data from 1998 to 2005 were available for all three

substitute activities (kayaking, rafting, canoeing), with some breakdown of the different types of kayaking use. Also available were breakdowns of activity participation for the 11-state West census region. Unlike the NSRE data, OIF data provide indications of recent year-to-year trends in participation and demographics. However, 2000 and 2001 OIF data were not directly comparable to the 2000-01 NSRE data, as the NSRE data represent a multi-year period of data collection rather than an independent year of data. In addition, trends between NSRE and OIF data were not comparable, as NSRE trends range from 1994/94 to 2000/01 and OIF trends range from 1998 to 2005.

Other national, multi-state Western region, and California non-motorized boating participation data sources included the Sporting Goods Manufacturers Association's (SGMA) *Sports Participation Topline Report, 2006 Edition*; the *2002 National Recreational Boating Survey Report (2003a)* and *State Data Report (2003b),* both prepared by Strategic Research Group in cooperation with the U.S. Coast Guard (USCG); and the California Department of Parks and Recreation (DPR) *Public Opinions and Attitudes on Outdoor Recreation - 2002 (2003).*

The nationwide SGMA data were available for all three substitute activities for the year 2005, and are comparable to OIF nationwide data for that year. Additional SGMA data for 1998, 2000, and 2004 allow trends to be determined. Information from the Strategic Research Group's *2002 National Recreational Boating Survey Report* (2003a) provided data on California boat operator participation; however, this information was not comparable to other more recent sources because of the unique aspects of the USCG survey that provided the data. The DPR data provided in *Public Opinions and Attitudes on Outdoor Recreation - 2002* were statewide and provided information on "paddle sports" participation. (The term "paddle sports" combines kayaking, rafting, and canoeing, along with rowing.) Because the DPR data combine boating activities, they are not comparable with more activity-specific statewide information. However, the DPR survey did provide data on unmet demand for "paddle sports" in California, among a list of 54 outdoor activities, a type of data which was not available elsewhere.

The best available sources of non-motorized boating participation information for the area roughly corresponding to the likely market area for enhanced whitewater opportunities in the Project area or region are the USFS *Recreation and Tourism Statistics Update* reports for the "local areas" surrounding the Plumas and Tahoe National Forests (2006c, 2006b). The "local area" was defined in these reports as all counties with center point within 75 miles of the counties in which the national forest lands lie. The local areas for these adjacent forests are similar; each includes Butte County and 18 other Northern California counties and 5 Western Nevada counties. The Tahoe National Forest local area includes three additional California counties to the south, while the Plumas National Forest local area includes one additional California county to the north. When the data were collected, each local area contained roughly 3.9-4.7 million residents, and included the major urban areas of Sacramento, California, and Reno, Nevada, and the smaller cities of Chico and Redding, California.

The *DeSabla-Centerville Relicensing Project Recreation Demand Study* by Pacific Gas and Electric Company (PG&E) (2007) provided information on unmet demand for paddle sports for Northern California based on a secondary analysis of the DPR (2003) survey data. The additional analysis reviewed responses from Northern California residents to a question regarding latent demand, which was to identify and rank those activities for which they would most probably increase their participation if good opportunities, facilities, and programs were available. From the study (as published in the October 2007 DeSabla-Centerville Project license application), it is unclear what constituted a resident of Northern California and how the secondary analysis took into account rankings and weightings of rankings related to the responses to the latent demand question. PG&E's demand study also projected activity participation in canoeing and rafting/floating for Butte County from 2005 to 2050. These projections were based on participation indexes for the West region from Cordell et al. (1999) that were multiplied by the estimated county population of individuals who were non-institutionalized and over the age of 16.

3.3.2 Use of Existing Whitewater Runs on the North Fork Feather River

In general, very little information is available on the use of whitewater runs in Northern California or Western Nevada, where existing runs would provide the most likely alternatives to a potential whitewater facility in the Project area or region. However, user counts have been conducted on the Rock Creek and Cresta reaches of the North Fork Feather River as part of the Rock Creek-Cresta Hydroelectric Project recreational flow release monitoring. As a requirement of the FERC license for the Rock Creek-Cresta Project, operated by PG&E, recreational flows have been released since 2002 on the two river reaches on one day, generally, each month between June and October (water is typically released on consecutive days to each reach, although releases to the Cresta reach were suspended in 2007 because of agency biological concerns). The amount of flow released is dependent upon water year type, with drier years resulting in less flow. Observation of the number of boaters using the Rock Creek and Cresta reaches of the North Fork Feather River was last conducted in 2005 (in 2006, the parties involved agreed that the triggers for additional flow days, an incentive for the use monitoring, had been met, and further monitoring would not be needed until additional flow days were added).

Although the 2005 monitoring results are for only two whitewater runs with scheduled releases (i.e., an artificially timed whitewater boating opportunity), the results are presented in Section 4.3.1.1 as a representation of the number of whitewater boaters that may also use additional opportunities provided in the Project area or region.

3.3.3 Local Whitewater Boater Characteristics and Preferences (Oroville Relicensing Study R-16 Focus Group)

During the performance of the Oroville Facilities Relicensing Study R-16, Whitewater and River Boating (DWR 2004), a focus group was convened to characterize the Big

Bend run (available at the upper end of Lake Oroville during low-water periods) and to determine how that whitewater run compares with other runs in the region. The group also provided information related to a stakeholder-proposed "whitewater park" development, the proposal of which was an incentive for Settlement Agreement Section B101, and thus this study. The focus group was held May 7, 2003, in Chico, California and consisted of 11 people, mostly members of a local whitewater group, each with knowledge of local and regional whitewater runs (WFG 2003). All participants filled out a survey with questions about the Big Bend run, other local runs, and the proposed whitewater park. Following the survey, participants were asked a series of group discussion questions on the survey topics. Additional details on the survey design and the discussion questions can be found in the Study R-16 Report.

3.4 CHARACTERIZATION OF EXISTING AND PROPOSED WHITEWATER BOATING FACILITIES IN THE UNITED STATES

An internet-based search was used to collect information on the ten whitewater boating parks specified in the Study Plan (five instream parks and five artificial channel parks). Whitewater boating park websites, as well as articles and studies focused on existing and proposed whitewater facilities, were used to synthesize information on the pertinent parks. The information sought for each park included opening date, type of park (public vs. commercial), course layout and length of run or runs, types of boating use supported, flow levels, whitewater difficulty class or classes, construction cost, other (non-boating) amenities provided, seasonal availability, and fee structure. Other information such as amount of use, user characteristics, events held at the facility, or other management information was also recorded when available.

Telephone interviews with course operators or managers were conducted to supplement the internet-based search. These interviews were primarily targeted at obtaining missing information, or more detailed information, on park use levels and user characteristics. A special effort was made to contact managers of the two large artificial channel parks constructed in recent years in Maryland and North Carolina, to determine whether their business and marketing operations included the collection of customer data, which could provide a rich source of information on the park's user characteristics.

Some user and financial characteristics of existing parks specified in the Study Plan were generally found to be unavailable from existing articles, studies, and research of other public information, such as public agency meeting and financial reports. This information was obtained for only a few parks during the supplemental telephone interviews. A summary of the whitewater boating parks by type is located in Section 4.4.

4.0 RESULTS & DISCUSSION

Section 4.0 provides the results of the whitewater boating supply and demand assessments, as well as a review of the characteristics of a potential whitewater park and users of such a park. In concert with a subsequent report on site-specific evaluations, these assessments will aid the SBF Steering Committee in determining the feasibility of constructing and operating whitewater boating (park and non-park) facilities and/or cost sharing such a project in the Project area or region.

Section 4.1 summarizes the key results of the scoping process, which have guided the preparation of the Phase 1 background report and will guide a forthcoming Phase 2 study on the results of the remaining tasks outlined in the Study Plan. Sections 4.2 and 4.3 summarize the results of the assessment of the potential for additional whitewater boating opportunities or facilities in the Project area or region based on an assessment of the existing supply and demand of such opportunities in the region. Section 4.3 also provides a summary of the type of people likely to use a potential new whitewater boating facility in the Project area or region, and current boaters' preferences for such a facility. Lastly, a description of existing whitewater boating parks in the United States is provided in Section 4.4 to shed light on the characteristics and operations of parks that might serve as models for all or portions of a potential park facility in the Project area or region.

These results provide the needed information upon which to determine the type (or types) of potential whitewater boating facility that might be viable in the greater Oroville area.

4.1 RESULTS OF THE STUDY SCOPING PROCESS

The study scoping process resulted in several important refinements and clarifications regarding the primary objectives of the study, and key aspects of how the study would be conducted, to faithfully meet the intent of Settlement Agreement, Section B101. The tasks included in the Study Plan were designed to meet the primary objective of Settlement Agreement Section B101, which is to ensure that the SBF Steering Committee obtains the necessary input on which to base decisions regarding the use of funds to implement a whitewater boating project.

The scoping process helped to define the role of the SBF Steering Committee in completing the study, particularly in the review and identification of potential whitewater park sites. To facilitate the Committee's participation in the study at critical junctions, and to provide clear milestones for sharing study work products, the Study Plan was restructured into two phases. Phase 1 was structured to include whitewater supply and demand assessments, as well as a compilation of information about existing and proposed parks in the United States, while Phase 2 was structured to include an evaluation and comparison of whitewater park concepts and potential sites to implement in the Project area or region.

The scoping process resulted in a refinement of study area boundaries, and the meaning of "region" for the purposes of the study, with the Study Plan clarifying that the region would expand for the purposes of the supply and demand assessments as presented in this Phase 1 report. However, the Phase 2 evaluation of potential whitewater park sites and non-park whitewater enhancements would be more closely associated with the more limited geographic region containing and surrounding the Oroville facilities.

Finally, the scoping process confirmed the need for the study to evaluate both park and non-park options for enhancing whitewater boating opportunities in the Project area or region.

4.2 WHITEWATER BOATING SUPPLY ASSESSMENT

This section describes the whitewater boating opportunities within an approximate 3-hour drive of the City of Oroville. This is roughly the distance that most boaters would be willing to travel to reach a whitewater park in the Project area or region. Whitewater runs are summarized by geographical area (i.e., three identified sub-regions of Northern California and Northern Nevada: the Northern Sierra, Cascades and Coast Range, and Central Sierra sub-regions) and by river systems in Table 4.2-1 and are mapped and identified by river in Figure 4.2-1. Appendix A includes more information on the individual whitewater runs summarized in Table 4.2-1, and a more detailed review of the existing whitewater boating opportunities that focuses on identifying what types of opportunities are most and least available to boaters in the region.

4.2.1 Whitewater Boating Opportunities in Northern California and Northern Nevada

In this study, the Northern Sierra sub-region extends from the lower Sacramento River south to the American River, south of the Project area and east into Northern Nevada. This sub-region includes 70 runs on 32 different rivers and creeks on 6 different river systems. (The Truckee River is the only river in Nevada with whitewater runs in this sub-region.) Runs in this sub-region vary widely in level of difficulty, but trend more toward higher difficulty classifications (i.e., Class IV-VI) (see Appendix B for a description of each difficulty class). The lengths of runs in this sub-region also vary, but the number of medium length runs (6-10 miles) outnumbers both short and long runs. Runs available during springtime months significantly outnumber runs available during other times of the year, with significantly fewer runs available in the winter and summer months, followed by even fewer fall season runs, and only a few year-round runs.

The Cascades and Coast Range sub-region, which extends from the upper Sacramento and McCloud Rivers to the north of the Project area, and south down to the San Francisco Bay area, includes 63 runs on 32 different rivers and creeks on 7 main river systems, plus a few smaller ones.

MAP WINDOW

CALIFORNIA

0 100 200 Miles

Oroville Facilities Project Area

LEGEND

Selected Whitewater Runs

Public Lands

US Forest Service

National Park Service

BLM

Source: DWR 2007 / Map prepared by EDAW 2007

0 10 20 40 Miles

Scale 1 : 1,267,200
1" = 20 miles
[Plot at 100% for 11x17]

Whitewater Boating Feasibility Study
Prepared for SBF Steering Committee

FIGURE 4.2-1

Northern California Whitewater Runs

Prepared by:	Date	
PJ -- EDAW, Inc.	12/09	P:\2000\0s016.gis\arcmap\region_whitewater_11x17.mxd

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Table 4.2-1. Summary of Northern California whitewater boating opportunities.

River(s)	# of Runs [a]	Optimum Difficulty Class [b]						Length (in miles) [c]			Season [d]				Counties [e]
		I-II	III	III-IV	IV	IV-V	V-VI	0-5	6-10	11+	Winter	Spring	Summer	Fall	
Northern Sierra	**70**	**8**	**7**	**12**	**8**	**13**	**22**	**22**	**29**	**19**	**18**	**64**	**19**	**11**	
Lower Sacramento River & Minor Tributaries	10	2		2	1		5	1	1	8	2	10	1	1	Shasta, Tehama, Butte
Feather River & Tributaries	14		1	2	1	4	6	3	10	1	5	12	3	5	Plumas, Butte
Yuba River & Tributaries	17	1		2	4	7	3	9	5	3	4	15	2	1	Yuba, Nevada, Sierra, Placer
Bear River	2	1		1				1	1			2		1	Nevada, Placer
Truckee River	4		4						3	1		4	4		Nevada, Placer, Sierra, Washoe
American River & Tributaries	23	4	2	5	2	2	8	8	9	6	7	21	9	3	Placer, El Dorado, Sacramento
Cascades & Coast Range	**63**	**15**	**12**	**10**	**7**	**14**	**5**	**14**	**27**	**22**	**48**	**55**	**17**	**11**	
Upper Sacramento & McCloud Rivers	8		4		2		2	1	5	2	3	8	2	1	Siskiyou, Shasta
Salmon River	3			1		2			2	1	3	3			Siskiyou
Trinity River & Tributaries	20	4	2	5		7	2	5	9	6	15	20	6	5	Trinity, Humboldt
Clear Creek & Brandy Creek	2				1		1	1	1		2	1		1	Shasta
Eel River & Tributaries	13	2	4	3	1	3		2	4	7	11	11	1	1	Lake, Trinity, Humboldt, Mendocino, Glenn
Cache Creek	4	2	1		1				2	2	2	2	3		Lake, Yolo, Colusa
Russian River & Tributaries	7	4	1			2		2	3	2	7	7	4	3	Sonoma, Mendocino
Other Small Coast Range Creeks	6	3		1	2			3	1	2	5	3	1		Colusa, Yolo, Glenn, Napa, Lake, Solano
Central Sierra	**9**	**0**	**1**	**1**	**4**	**1**	**2**	**2**	**4**	**3**	**6**	**9**	**1**	**1**	
Cosumnes River	5			1	3		1		4	1	5	5			El Dorado, Amador, Sacramento, Placer
Mokelumne River	4		1		1	1	1	2		2	1	4	1	1	Amador, Calaveras, Alpine

Sources: Holbek and Stanley 1998, Cassady & Calhoun 1995, Tuthill et al 2008, American Whitewater 2006, Shackleton 2007, and EA Engineering, Science, and Technology 1993.

Notes:

(a) Runs are described by sources as distinct river segments, but many are continuous along certain rivers.
(b) Difficulty class can vary based on flows and therefore difficulty class ratings based on optimum desired flows are given.
(c) Length classifications were generalized from GIS calculated lengths.
(d) May include a portion of a season up to an entire season. When multiple seasons are included, each season is counted.
(e) Includes all counties through which the runs on the river or tributaries pass.

Runs also vary in difficulty classification, although more evenly distributed among the different classes than in the Northern Sierra sub-region. The length of runs in the sub-region also vary, with a notably smaller number of short-length runs than medium-length or long runs. Most runs are available during the winter and spring months, with less than a third as many available during the summer and fall.

The Central Sierra sub-region, which begins generally south of the American River and Highway 50, includes only two rivers (the Cosumnes and Mokelumne), as these are on the edge of the 3-hour travel boundary; rivers farther south are beyond a 3-hour drive from Oroville. Most of the runs included within this sub-region are more difficult (Class IV and higher), with only two runs having a moderate difficulty class rating, and no runs classified as easy. Only two runs in the sub-region are short in length, with most either medium or long in length. All whitewater runs included in the Central Sierra sub-region are available in the spring, with all of the runs on the Cosumnes River also available in the winter and one run on the Mokelumne River available all year.

4.2.2 Conclusions on the Supply of Whitewater Boating Opportunities in the Region

While only one whitewater park exists in the Northern California and Northern Nevada region (in Reno, Nevada), many whitewater runs are available, particularly in the Northern Sierra. Within the Northern Sierra sub-region, more than 30 runs are available on the Feather and Yuba Rivers and their tributaries. Many of these runs are located in Butte County or adjacent Plumas and Yuba Counties, or counties immediately to the south and closer to the Sacramento metropolitan area, putting them within a 2-hour drive of Oroville. However, many of these runs are difficult, and most are only available for use during the spring. Many additional runs are available at somewhat greater distances from the Oroville area, in the Cascade Range (particularly on the Trinity River and tributaries) north of Oroville, and in the Coast Range (particularly on the Eel and Russian Rivers and tributaries), to the west and southwest of Oroville.

Based on this assessment, it is clear that whitewater opportunities throughout the study area region (defined as the area whose residents are within an estimated 3-hour drive from Oroville) are generally limited in the summer and even more so in the fall season. Significantly fewer runs are available in the summer and fall for all sub-regions, as well as in the winter for the Northern Sierra sub-region. Fewer than 20 runs are available three seasons or year-round, and many of those runs are in the lowest difficulty class (I-II) or are dependent on a limited number of scheduled summer and fall dam releases.

4.3 WHITEWATER BOATING DEMAND ASSESSMENT

To determine the potential demand for and/or potential use of enhanced whitewater boating opportunities or a whitewater boating park in the Project area or region, an understanding of the existing and potential future demand for whitewater boating activities is needed. The following sections summarize the results of an assessment of existing and potential future demand for whitewater boating in the Project area or region.

4.3.1 Existing Demand for Whitewater Boating

Current or recent participation (depending on the years for which data were available) in whitewater boating is the primary indicator of the existing level of demand for whitewater boating activities. Because relatively little information is available on whitewater boating specifically, this assessment, in large part, relies on participation data for the more general non-motorized boating activities of kayaking, canoeing, and rafting. Some data were available to determine what portion of those more general activities may be composed of whitewater boating activities in particular. The results of the existing demand assessment are presented below and include participation in non-motorized/whitewater boating nationally, regionally, and within California. Indicators of unmet demand for whitewater boating statewide and specifically within Northern California are also described. Finally, recent use levels of two whitewater runs on the North Fork Feather River, near Oroville, are described as an indicator of demand for whitewater boating close to the Project area.

4.3.1.1 National, Regional, State, and Sub-state Non-Motorized and Whitewater Boating Participation

Current National Participation

Current participation in canoeing, kayaking, and rafting can be viewed on many levels – national, regional, state, and sub-state. *Outdoor Recreation for 21st Century America* (Cordell et al. 2004) presents NSRE data for freshwater non-motorized boating activities in 2000-01 for the entire United States. These data indicate that of the three activities, freshwater kayaking had the lowest participation (Table 4.3-1); freshwater rafting and canoeing had about four times as many participants as kayaking. Although freshwater kayaking participation was lower, kayaking participants spent, on average, a higher number of days per year kayaking than canoeing or rafting participants. However, for all three freshwater activities, about one-half of the participants spent only 1 or 2 days a year participating in each activity (Table 4.3-2). Data also indicate that the vast majority of participants in all three activities spent between 1 and 10 days a year participating. Cordell et al. (2004) state that most freshwater rafting is in whitewater with rented or guided commercial rafts, and although most freshwater canoeing is in still water, a sizeable portion is in whitewater.

Table 4.3-1. Nationwide annual participation in freshwater non-motorized boating activities, 2000-01.

Activity	Millions of Participants	Percent of the Population Participating
Freshwater kayaking	5.1	2.4
Freshwater rafting	20.2	9.5
Freshwater canoeing	19.4	9.1

Note: Participants were age 16 and older. Population based on the November 2000 estimate of 213.1 million civilian, noninstitutionalized U.S. population ages 16 and older.
Source: Cordell et al. 2004.

Table 4.3-2. Nationwide annual participation in freshwater non-motorized boating activities (days per year), 2000-01.

Activity	Average # of Days/Year Participating	Percent of People Participating				
		1-2 Days/Year	3-10 Days/Year	11-25 Days/Year	25-50 Days/Year	51+ Days/Year
Freshwater kayaking	8.8	44.6	39.2	9.1	4.2	2.8
Freshwater rafting	4.4	58.1	32.7	7.1	1.7	0.4
Freshwater canoeing	6.2	45.4	42.7	8.3	2.4	1.2

Note: Participants were age 16 and older.
Source: Cordell et al. 2004.

More recent nationwide data are available in the OIF Outdoor Recreation Participation Study (8th edition, 2006). Data from 1998 to 2005 are available for canoeing, rafting, and kayaking (2001 to 2005 data only), with some breakdown of the different types of kayaking use. In 2005, OIF data indicate that there were 20.8 million canoeing participants, 10.6 million rafting participants, and 12.6 million kayaking participants, of which 2.2 million people participated in whitewater kayaking (Table 4.3-3). OIF data indicate that non-whitewater kayaking is the most popular form among kayaking participants, with participation in whitewater kayaking the lowest among all paddle sports.

Table 4.3-3. Nationwide annual participation in non-motorized boating activities, 2005.

Activity	Millions of Participants	Percent of the Population Participating
Kayaking	12.6	5.6
Whitewater kayaking	2.2	1.0
Sea/Tour kayaking	5.6	2.5
Sit-on-top kayaking	9.0	4.0
Rafting	10.6	4.7
Canoeing	20.8	9.3

Note: Participants were age 16 and older.
Source: OIF 2006.

The average number of outings is also provided in the OIF data (Table 4.3-4). Kayaking had the highest average number of outings, followed by canoeing and then rafting. Data also indicate that more than one-third of kayakers and canoeists, as well as 60 percent of rafters, only went on one outing per year.

Table 4.3-4. Nationwide annual participation in non-motorized boating activities (number of outings), 2005.

Activity	Average # of Outings	Percent of Participants Going on Only 1 Outing
Kayaking	6.0	36
Rafting	2.0	60
Canoeing	4.0	38

Note: Participants were age 16 and older.
Source: OIF 2006.

As a comparison to the OIF data, the SGMA data from the Sports Participation Topline Report (2006 edition) estimate that there were approximately 7 million kayakers in 2005, about one-half as many as estimated by the OIF (Table 4.3-5). SGMA data also estimate that there were 4.5 million rafters in 2005, again about one-half as many as the OIF estimate, and 11.8 million canoeists, just over one-half of the OIF estimate.

Table 4.3-5. Comparison of OIF and SGMA non-motorized boating annual participation data, 2005.

Activity	OIF Data Millions of Participants	SGMA Data Millions of Participants
Kayaking	12.6	7.0
Rafting	10.6	4.5
Canoeing	20.8	11.8

Note: Participants in OIF data were age 16 and older. Participants in SGMA data were age 6 and older.
Source: OIF 2006 and SGMA 2006.

Current Regional and Census Division Participation (by State)

On a state level, NSRE data by census region were also broken down into census divisions and then by state in Cordell et al. (2004). The Pacific census division includes California, Alaska, Hawaii, Washington, and Oregon. Within the Pacific census division, 7.0 percent of the California population participated in rafting, 4.3 percent participated in canoeing, and 4.4 percent participated in kayaking in 2000-01 (Table 4.3-6). While the interests of this study are focused on California, the data for the other four states provide some context to the California data. Thus, it is interesting to note that participation in California was lower than Alaska, Oregon, and Washington for all three activities and lower than Hawaii for canoeing and kayaking. Notably, the other four states had substantially higher percentages of participation in canoeing. Hawaii also had a substantially higher percentage of participation in kayaking compared to the other four states. (It may be surmised that the abundance of lakes supporting canoeing in Alaska, and the coastal environment of Hawaii supporting non-whitewater types of

kayaking, are important factors in the relatively high participation in those activities in those states.)

Table 4.3-6. Annual participation in non-motorized boating activities within the Pacific census division, 2000-01.

	Percent of the State Population Participating				
Activity	**California**	**Oregon**	**Washington**	**Alaska**	**Hawaii**
Kayaking	4.4	5.1	5.1	5.9	12.0
Rafting	7.0	15.5	12.2	11.9	2.2
Canoeing	4.3	8.6	9.4	16.9	8.9

Note: Percentages based on number of people participating one or more times in the previous 12 months. Participants were age 16 and older.
Source: Cordell et al. 2004.

Current Participation in California

Strategic Research Group's 2002 National Recreational Boating Survey State Data Report (2003b) provides boat operator participation data by state (the survey addressed both motorized and non-motorized boating). In 2002 in California, just under 5 percent of boat operators engaged in what the study termed "whitewater sports." Almost 19 percent of canoe activities in California were in whitewater sports, and 14 percent of kayak activities were in whitewater sports. In 2002, the Strategic Research Group found that 26 percent of California boaters used a kayak, and 13 percent of boat operators used a kayak most often (third in popularity behind open motor boats and personal watercraft).

Although less activity-specific than other survey sources, the DPR 2002 Public Opinions and Attitudes on Outdoor Recreation (2003) survey data provide some additional state-level analysis of kayaking, rafting, and canoeing participation. The DPR survey grouped the sport of rowing with kayaking, rafting, and canoeing into an activity labeled "paddle sports." In 2002, DPR survey data estimated that 23 percent of Californians participated in paddle sports, ranking paddle sports 27 among 55 activities in terms of participation. The average number of days that all Californians spent on paddle sports was 1.9 days, compared to a paddle sport participant-only average of 7.7 days spent on the activity. These averages put paddle sports in the lower one-quarter of activities based on average participation days.

DPR also surveyed California youth on their participation in a number of activities. DPR survey data estimated that 31.8 percent of California youth participated in paddle sports, ranking the activity 29 of 50 activities in terms of youth participation. California youth averaged 2 days of participation in paddle sports in 2002, ranking paddle sports 39 of 46 activities based on average participation days.

Although more dated than other state-level information sources, the 1994-95 NSRE included questions regarding whitewater canoeing and kayaking. More than 2,000

Californians were included in that survey, and about one-third of those residents had participated in boating (motorized or non-motorized) during the past 12 months. As Table 4.3-7 indicates, in general, few Californians participated in canoeing or kayaking (2.5 and 1.4 percent, respectively), and even fewer participated in whitewater canoeing or kayaking (1.1 percent). Rafting participation was higher, but the survey question included "tubing and other floating" with rafting, activities that are not primarily associated with whitewater. Of those who did participate in canoeing, kayaking, or rafting, most participated 4 days or less (Table 4.3-8). Also, of those who participated in one of the three activities, 22 to 33 percent did not make any trips primarily to participate in the given activity, and 27 to 36 percent made only one trip primarily to participate in the given activity (Table 4.3-9).

Table 4.3-7. California residents' annual participation in canoeing, kayaking (all types and in whitewater), and rafting, 1994-95.

Activity	Percentage of California Respondents	Percentage of California Boaters
Went canoeing	2.5	7.9
Went kayaking	1.4	4.5
Went canoeing and kayaking	1.1	3.6
Went canoeing or kayaking or both	5.1	16.0
Went canoeing or kayaking in whitewater[(a)]	1.1	3.4
Used a closed canoe[(b)]	<1	1.6
Went rafting[(c)]	8.0	25.1

[(a)] 21.4% of canoers and kayakers went canoeing or kayaking in whitewater.
[(b)] Closed canoes are generally used in whitewater.
[(c)] Rafting also includes "tubing and other floating".
Note: N=2005.
Source: NSRE 1994-95, Option 1 and 2 (California respondents only).

Table 4.3-8. California residents' annual participation in canoeing, kayaking, and rafting (number of days), 1994-95.

Activity	% of Respondents that Participated in Stated Number of Days				Mean (in Days)
	1 Day	2-4 Days	5-10 Days	10+ Days	
Canoeing	20.9	39.6	28.0	11.5	5.4
Kayaking	40.6	43.7	12.5	3.1	8.5
Rafting[(a)]	27.7	41.7	22.8	8.0	5.6

[(a)]Rafting also includes "tubing and other floating."
Notes: Canoeing N = 43, Kayaking N = 32, and Rafting N = 101.
Any part of a day was counted as a whole day.
Source: NSRE 1994-95 Option 1 (California respondents only); survey questions did not address number of days of participation in whitewater activities specifically.

Table 4.3-9. California residents' annual participation in canoeing, kayaking, and rafting (number of "primary purpose" trips), 1994-95.

Activity	% of Respondents that Participated					Mean # of Trips
	0 Trips	1 Trip	2-4 Trips	5-10 Trips	10+ Trips	
Canoeing	22.2	31.1	24.5	15.6	6.6	2.8
Kayaking	33.3	27.3	27.3	9.1	3.0	5.0
Rafting[(a)]	22.8	35.6	24.8	11.9	5.0	3.5

[(a)] Rafting also includes "tubing and other floating."
Notes: Canoeing N = 45, Kayaking N = 33, and Rafting N = 101.
Source: NSRE 1994-95 Option 1; survey questions did not address number of days of participation in whitewater activities specifically.

Most whitewater rafting participation occurs as part of commercial guided rafting trips (Plyler 2006), rather than private boaters using personal boats. Although data on participation in rafting with individual commercial outfitters in California were not available, a trade association lists 45 rafting outfitters operating in the state (California Outdoors 2009). A dozen or more outfitters were listed as providing trips on popular Northern California rivers such as the Middle and North Fork American, Klamath, and Salmon. Several of the larger companies provide trips on multiple rivers.

Current Participation in Northern California and Western Nevada

More recent NSRE data are available on a sub-state level. The USFS Southern Research Station developed a report series entitled *Recreation and Tourism Statistics Update*, which provides outdoor activity participation data by the local population around individual national forests (USFS 2006b). A national forest's local area is generally comprised of the counties within a 75-mile distance of the forest. Data are available from the 2000-04 NSRE for the Tahoe National Forest local area, which provide information for 22 Northern California counties from south of Sacramento to north of Redding, and 5 Western Nevada counties. The total population of that area (2004 census estimate) was 4.6 million, of which nearly 4.1 million resided in the 22 Northern California counties. (The local area for the Plumas National Forest encompasses 19 of the same Northern California counties as the Tahoe National Forest local area but did not include three counties south of Sacramento. As results were similar for both forests, only the Tahoe National Forest data are described here.)

Participation in canoeing, kayaking, and rafting in Northern California and Western Nevada was found to be substantially higher than for the State of California as a whole. Within the Tahoe National Forest local area, 11.4 percent of the population (approximately 400,000 people) participated in rafting. Kayaking and canoeing had less participation, with 7.2 percent (approximately 250,000 people) and 6.7 percent (approximately 233,000 people) of the population participating, respectively (see Table 4.3-10).

Table 4.3-10. Tahoe National Forest local area[(a)] residents' annual participation in non-motorized boating activities, 2004.

Boating Activities	Percent Participating	Number of Participants
Canoeing	6.7	233,316
Kayaking	7.2	249,933
Rafting[(b)]	11.4	398,486

[(a)] The Tahoe National Forest local area includes 22 Northern California and 5 Western Nevada counties. Source: NSRE 2000-04.
[(b)] Rafting also includes "tubing and other floating."

Although these data address all types of kayaking, canoeing, and rafting (but not whitewater activities specifically), the higher levels of participation as compared to statewide survey results are of particular interest because the Tahoe National Forest local area includes all of the natural whitewater runs within the Northern Sierra and Central Sierra sub-regions, and several in the Cascades and Coast Range sub-region, as described in Section 4.2. The area also includes the regional population centers of Sacramento, Chico, and Redding, California, and Reno, Nevada, that would be likely to provide many of the potential visitors to a whitewater facility in the Oroville area or vicinity. Thus, these data may be taken to represent, in part, a core regional population of paddlers who make use of the numerous natural whitewater runs in their vicinity, and who may be interested in a new or enhanced whitewater boating opportunity in the Oroville area or vicinity.

Summary and Comparison of Whitewater Boating Participation Data

Although the participation data from the Cordell et al. (2004) NSRE data set and OIF data set are for different years (2001 and 2005, respectively), these data sets can be generally compared to determine any potential similarities. Both Cordell et al. (2004) NSRE and OIF data indicated that canoeing had a high participation among the three activities, kayaking had a high number of participation days per year, and most participants in all three activities (rafting, canoeing, and kayaking) only participated a few days per year. OIF and SGMA data are comparable for the same year, 2005. The OIF data estimated about twice as much participation in the three activities as estimated by the SGMA data. However, both data sets indicated that canoeing was the most popular activity of the three, followed by kayaking and then rafting. On a state level, Strategic Research Group (2003b) data showed low participation by California boaters in whitewater sports (just under 5 percent) and less than 20 percent participation in whitewater sports within canoe and kayaking boating activities. Although more dated, the 1994-95 NSRE results for California respondents also indicate low participation in whitewater boating.

Interesting conclusions can also be drawn from individual data sets. Within the Pacific census division, NSRE 2000-01 data in Cordell et al. (2004) indicated that California had lower percentages of the population participating in all three activities compared to the other states in the region. As a combined activity in the 2002 DPR data, paddle

sports had mid-level participation compared to the other activities in the survey and a low average number of participation days compared to the other activities surveyed. However, the USFS Southern Research Station's NSRE sub-state level data by national forest local area, in this case the Tahoe National Forest local area, showed a substantially higher percentage of the local area population participating in all three activities than at the state level (as part of the Pacific census division). With as many as 19 rafting outfitters providing trips on popular rivers in Northern California (such as the Middle Fork of the American), a substantial interest in participation in this form of whitewater recreation appears to exist, despite the overall participation numbers and frequency being relatively low.

4.3.1.2 Statewide and Northern California Unmet Demand for Whitewater Boating

DPR's *2002 Public Opinions and Attitudes on Outdoor Recreation* (2003) survey provided not only participation data, but also data for unmet demand for 55 activities. The DPR 2002 survey asked respondents to identify and rank those activities for which they would "most probably increase their participation if good opportunities, facilities, and programs were available" as an indicator of unmet or "latent" demand. "Paddle sports" (the activity within the survey that includes kayaking, canoeing, and rafting) ranked 13 out of 55 activities in terms of latent demand.

The top five activities with high latent demand were camping in developed sites, trail hiking, walking, wildlife viewing/bird watching/viewing natural scenery, and bicycling on paved surfaces. Other activities with considerably greater latent demand than paddle sports were picnicking in developed sites, freshwater fishing, attending outdoor cultural events, and camping at a primitive site without facilities. These data indicate that there appears to be at least a moderate interest among Californians to participate in paddle sports if more opportunities were available, despite there being several other activities that Californians expressed a higher interest in.

The Recreation Demand Study performed by PG&E as part of the FERC relicensing for the DeSabla-Centerville Project provided similar latent demand information for Northern California (PG&E 2007). The study used a subset of the statewide DPR survey data to identify unmet demand for respondents from Northern California, producing 202 respondents. Of the 202 respondents, only 47 answered the unmet demand question.

According to the PG&E study, four activities were identified as having high unmet demand: trail hiking, camping in recreation vehicle (RV)/trailer sites with hookups, camping in developed sites with facilities, and horseback riding. Although not statistically meaningful, this information is useful to identify what activities Northern Californians believe they would like to participate in more. Two of the activities in the Northern California top four were also in the overall top five for all respondents, trail hiking and camping in developed sites. Paddle sports (the DPR survey activity that includes kayaking, canoeing, and rafting) was not in the top four activities, and it is unknown how respondents from Northern California rated this activity in terms of latent

demand. In their FERC license application, the South Feather Water and Power Agency also noted in their Whitewater Boating Study (2007) that there is latent demand for fall whitewater runs within the region around the South Fork Feather River and within the Sierras in general at higher elevations.

4.3.1.3 Use of Existing Whitewater Runs on the North Fork Feather River

The Rock Creek and Cresta reaches of the North Fork Feather River are part of the Northern Sierra sub-region as described in Section 4.2. Each of these reaches contains one whitewater run. The Rock Creek run provided 8 miles of Class III to Class V water that is normally available in the spring. The put-in for the run is about a 45-mile drive northeast from Oroville. Just downstream is the Cresta run, a 6.5-mile Class III to Class V run that is also normally available in the spring. As part of the new FERC license for the Rock Creek-Cresta hydroelectric project, recreational flows have been released since 2002 on both reaches (PG&E 2006). The releases generally are scheduled for one weekend each month between June and October, dependent on water year type. The recreational flow releases provide 4 or 5 days of use on these two runs during the summer and fall when the runs are not normally available. The release schedule and recreation streamflow information are posted on the American Whitewater website (American Whitewater 2006). In addition, monitoring of boating use on the reaches during the release events has been done, most recently in 2005.

As shown in Table 4.3-11, use of the Rock Creek run was lowest during the June release (47 boaters) and highest for the August and September releases (262 and 251 boaters, respectively). For the Cresta reach, use was lowest in July (83 boaters); similar to the Rock Creek run, use was highest for the Cresta reach in August and September (214 and 253 boaters, respectively). The overall turnout for each 1-day release indicates that there is a considerable demand for whitewater boating opportunities in the summer and fall seasons in the vicinity of the Project area.

Table 4.3-11. Rock Creek and Cresta whitewater run recreation flow release use estimates, 2005.

Month of Recreation Flow Release[(a)]	Rock Creek Reach (# of Boaters)	Cresta Reach (# of Boaters)
June	47	No data[(b)]
July	102	83
August	262	214
September	251	253
October	186	155

Notes:
[(a)] Recreation flow releases occurred on June 26, July 24, August 28, September 25, and October 16 for the Rock Creek reach and on July 23, August 27, September 24, and October 15 for the Cresta reach.
[(b)] There was no recreation flow release on the Cresta reach in June because of the presence of a foothill yellow-legged frog egg mass 21 days in advance of the scheduled release.
Source: PG&E 2006.

4.3.2 Future Demand for Whitewater Boating

An understanding of recent whitewater boating participation trends, as well as a prediction of future whitewater boating participation in the Project area, are beneficial to understanding if whitewater boating participation is likely to increase or decrease in the future, and thus if demand for whitewater activities in the Project area or region is likely to increase or decrease from existing levels. The results of the future demand assessment are presented below and include national and regional trends in whitewater boating participation (as statewide trends are not available) and an estimate of future whitewater boating participation in Butte County.

4.3.2.1 Trends in Non-motorized/Whitewater Boating Participation

Data on current trends in kayaking, canoeing, and rafting are available from several sources including Cordell et al. (2004) (NSRE data), OIF, and SGMA.

National Trends in Participation

According to the NSRE data in Cordell et al. (2004), kayaking has seen an especially dramatic national increase in the number of participants since 1994-95 compared to the other two activities. Participation in kayaking increased approximately 186 percent between 1994-95 and 2000-01 (Table 4.3-12). Canoeing and rafting have had less dramatic increases in participation between 1994-95 and 2000-01. Canoeing participation has risen 50.7 percent in that time period, while rafting has had the smallest increase at 36.6 percent. As the data indicate, although kayaking has had a large increase in participants, the number of people participating in kayaking is still only about one-third of the number of people participating in rafting or canoeing.

Table 4.3-12. National trends in annual participation in non-motorized boating activities, 1994-95 and 2000-01.

	1994-95		2000-01	
Activity	**% Population Participating**	**Millions of Participants**	**% Population Participating**	**Millions of Participants**
Kayaking	1.3	2.6	3.5	7.4
Rafting	7.6	14.9	9.5	20.3
Canoeing	7.0	13.8	9.7	20.7

Source: Cordell et al. 2004.

Cordell et al. (2004) provide some indication of how these levels of participation relate specifically to whitewater activity, stating that, in 1995, an estimated 21.1 percent of canoeists and kayakers used their boats in whitewater. Also, Cordell et al. (1999) state that 0.4 percent of the 1994-95 population (800,000 people) used closed-top canoes, which are typically designed for whitewater use. In terms of days of participation, the NSRE data indicate that most participants in all three activities have continued to spend 1 to 10 days a year on the activity, with approximately one-half of participants spending only 1 or 2 days a year on the activity.

The SGMA report provides more recent national participation data from 1998, 2000, 2004, and 2005 from which limited non-motorized boating trends can be identified. According to the SGMA data, kayaking participation has almost doubled since 1998 (Table 4.3-13). On the other hand, SGMA data show participation in rafting decreasing from 1998 to 2004 and then increasing between 2004 and 2005 by 7 percent. Likewise, the data show canoeing decreasing between 1998 and 2004 and then increasing between 2004 and 2005 by almost 3 percent.

Table 4.3-13. National trends in annual participation in non-motorized boating activities, 1998 to 2005.

	Millions of Participants			
Activity	**1998**	**2000**	**2004**	**2005**
Kayaking	3.50	4.14	6.15	6.96
Rafting	5.57	4.94	4.21	4.51
Canoeing	13.62	13.13	11.45	11.78

Note: Participants were age 6 and older.
Source: SGMA 2006.

OIF data provide canoeing and rafting participation information from 1998 to 2005 and kayaking participation information for 2001 to 2005. These data show fairly consistent numbers of participants for canoeing and rafting from 1998 to 2005, with peaks in 2001. The study states that over the last 8 years, canoeing has consistently been the most popular paddle sport. Participation in canoeing has ranged from 18 million people in 1998 to 24 million people in 2001 (Figure 4.3-1). Currently, OIF data show the number of participants in canoeing decreasing from 22.3 million in 2004 to 20.8 million in 2005. Concurrently, the percentage of the population participating in canoeing has remained between 8 and 10 percent, apart from 2001 which peaked at 11.2 percent (Figure 4.3-2). Participation in rafting has had similar consistency to canoeing, ranging from 9.7 million participants in 1998 to 12.4 million participants in 2001. Unlike canoeing, OIF data show an increase in rafting participants from 2004 to 2005. The percentage of the population participating in rafting has varied even less than canoeing, ranging from 4.2 percent to 4.7 percent, apart from peak years in 2001 and 2002.

OIF whitewater kayaking data do not extend as far back, but show varying participation levels for 5 consecutive years. The number of participants has ranged from 1.8 million in 2003 to 3.9 million in 2002. However, the number of participants remained steady from 2004 to 2005, with 2.2 million participants. The percentage of Americans participating in whitewater kayaking has stayed fairly steady, from 0.8 percent to 1.2 percent, apart from a peak in 2002 at 1.8 percent.

OIF data also provide the total and average number of outings by activity from 1998 to 2005 (2001 to 2005 for kayaking) (Figures 4.3-3 and 4.3-4).

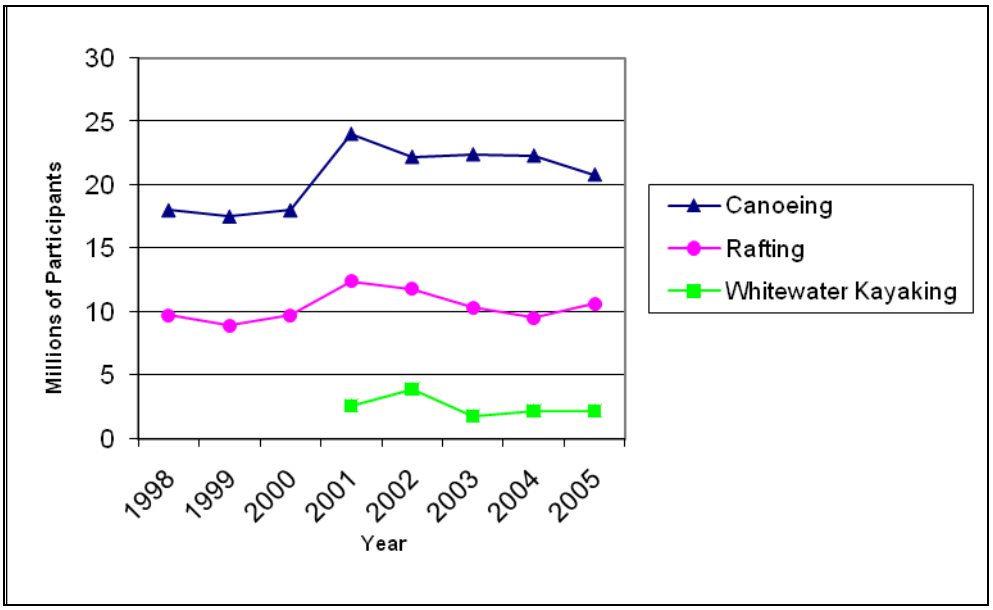


Figure 4.3-1. National trends in numbers of annual participants in non-motorized boating activities, 1998 to 2005.
Source: OIF 2006.

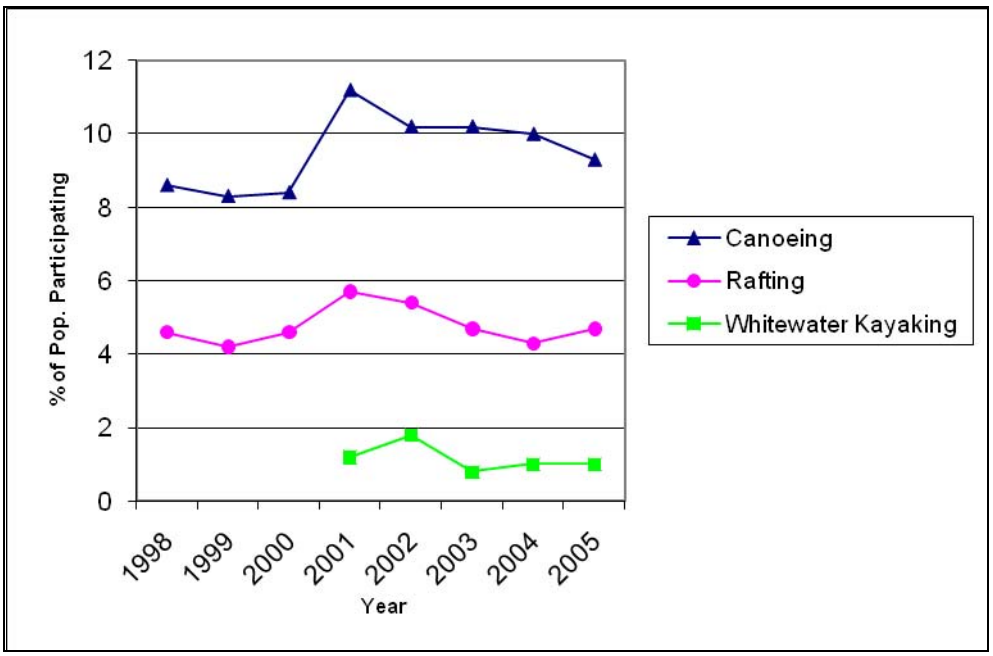


Figure 4.3-2. National trends in the percent of the population participating in non-motorized boating activities, 1998 to 2005.
Source: OIF 2006.

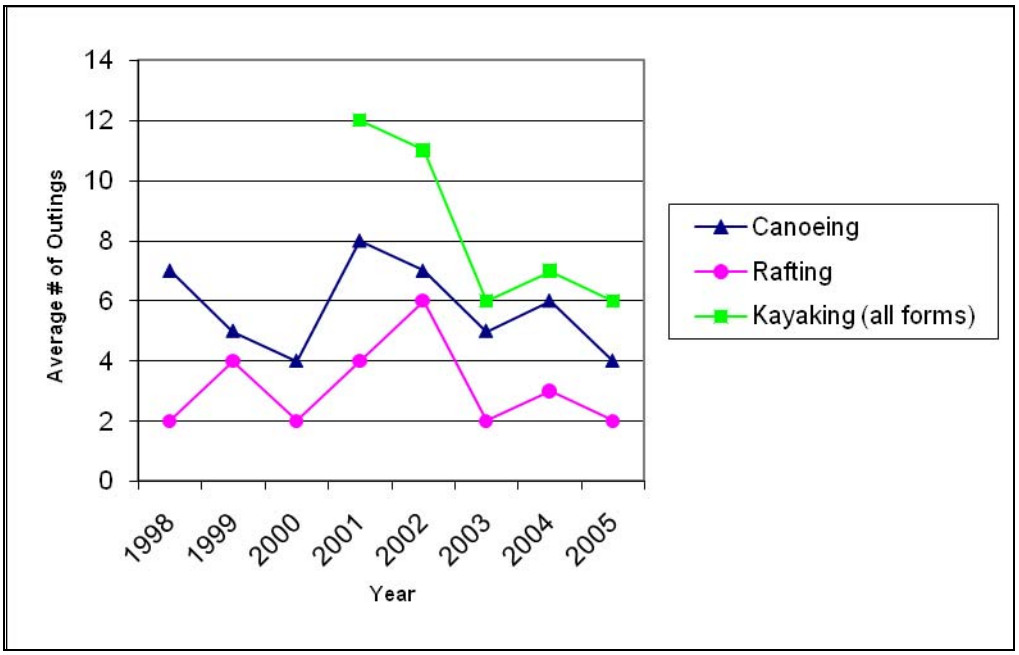


Figure 4.3-3. National trends in the average number of outings for boating activities, 1998 to 2005.
Source: OIF 2006.

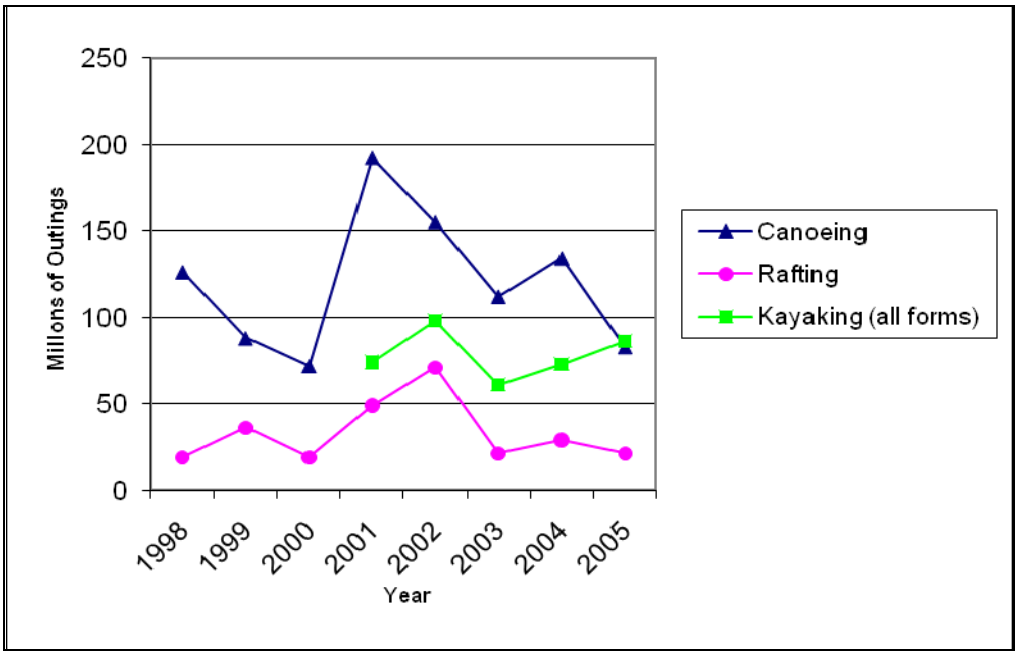


Figure 4.3-4. National trends in the total number of outings for boating activities, 1998 to 2005.
Source: OIF 2006.

For canoeing, the total and average numbers of outings have somewhat mimicked changes in the number of participants. Canoeing outings spiked in 2001 and have generally declined since then. Similar to the decrease in the number of participants, both the total and average number of canoeing outings have decreased between 2004 and 2005. As for rafting, the total and average numbers of outings have not always followed increases and decreases in the number of participants. Both total and average rafting outings peaked in 2002, and then decreased in 2003 with a slight rise in 2004 and decreasing again in 2005.

The total number of kayaking outings (all forms of kayaking) has followed increases and decreases in the number of kayaking participants; however, the average number of outings has not followed this trend. The average number of kayaking outings fell by half from the 2001 peak of about 12 outings to about 6 outings in 2005.

Regional Trends in Participation (West Census Region/Pacific Census Division)

OIF data also suggest recent regional trends in kayaking, canoeing, and rafting within the West census region. Each year from 2001 to 2005, between 5 and 7 percent of the population participated in kayaking (all forms). Similarly, 5 to 7 percent of the population participated in canoeing and 4 to 7 percent participated in rafting most years between 1998 and 2005. Thus, the regional participation trends essentially mirrored the national trends described above. (To provide context to these West census region data, it is worth noting that kayaking and rafting participation within the other three census regions – North Central, Northeast, and South Central - were within +/- 1 or 2 percent of the West region most years. Canoeing participation, on the other hand, has consistently been 5 to 9 percent higher in the North Central and Northeast regions than in the West region.)

According to the NSRE data in Cordell et al. (2004), the trend of increasing kayaking participation in the Pacific census division from the late 1990s to 2001 somewhat mirrored the national increase during that time period, with 700,000 participants in 1994-95 and 1.8 million participants in 2000-01, a 146 percent increase (calculation based on unrounded numbers).

Crossover Participation Between Non-Powered Boating Activities

A unique aspect of the OIF data is information provided on crossover participation between boating activities from 2003 to 2005. The information was derived by calculating the percentage of participants in one activity, such as kayaking, who also participated in other activities addressed by the OIF survey. Although cross-participation information for many activities is presented in the source report, only crossover participation between potential whitewater boating activities is described here. Of particular interest is the percentage of respondents who participated in canoeing, rafting, or any type of kayaking (many of whom would have been reporting participation in non-whitewater boating) who also participated in whitewater kayaking.

Canoeing participants rarely also participated in whitewater kayaking, but about one in five also participated in rafting (Table 4.3-14). Similarly, few rafters were also whitewater kayakers, but much more commonly participated in canoeing, although the percentage of crossover has declined from 2003 to 2005. From 41 to more than 50 percent of kayakers of all types crossed over into canoeing, and about one in five crossed over into rafting.

Table 4.3-14. Annual trends in crossover participation in non-motorized boating activities, 2003 to 2005.

Participated in:	Also Participated in:	2003	2004	2005
Canoeing	Rafting	23%	18%	19%
	Non-whitewater kayaking	19%	24%	23%
	Whitewater kayaking	4%	5%	6%
Rafting	Canoeing	49%	41%	37%
	Non-whitewater kayaking	17%	23%	17%
	Whitewater kayaking	7%	8%	6%
Kayaking (any type)	Canoeing	46%	56%	41%
	Rafting	21%	23%	16%
	Non-whitewater kayaking	92%	93%	95%
	Whitewater kayaking	18%	22%	17%

Note: The OIF Outdoor Recreation Participation Survey included only participants age 16 and older. The sample of whitewater kayakers was too small to allow crossover analysis specific to whitewater kayaking.
Source: OIF 2006.

These results suggest that recreationists participate in multiple types of non-motorized boating and may be more attracted to a facility that provides for multiple uses. This may be particularly true of the small segments of canoeists, who may be primarily non-whitewater boaters, and rafters, who may primarily be participants in commercial rafting trips, that also participate in whitewater kayaking.

Perhaps most relevant to this study is the indication that 92 to 95 percent of outdoor recreationists who had participated in any type of kayaking participated in non-whitewater kayaking, while only 17 to 22 percent each year had participated in whitewater kayaking. Thus, it seems logical to assume that other data treating kayakers as an undifferentiated group (i.e., the several types of non-whitewater kayaking are combined with whitewater kayaking) primarily relate to non-whitewater kayaking. In support of this, 2001 and 2002 kayak sales within the Schuylkill River National and State Heritage Area Outdoor Recreation Business Study (Ogden et al. 2004) showed that less than 15 percent of the kayaks sold were types used for whitewater kayaking; the American Whitewater Accident Study (Plyler 2006) similarly reported that according to sales data from Paddlesports Business (1999) (as cited in Plyler 2006), less than 15 percent of kayaks sold were types used for whitewater kayaking (whitewater or inflatable kayaks).

Summary and Comparison of Boating Trend Data Across Sources

Differences occur between all of the data sets, most notably regarding increases and decreases in participation in the three activities. Cordell et al. (2004) NSRE data indicate increasing use in all three activities between 1994-95 and 2000-01. Interestingly, OIF data show 2001 to be the recent peak in participation for canoeing and rafting. The OIF and SGMA data sets differ on the recent participation in activities over the same time period, 1998 to 2005. OIF data indicate fairly steady participation in kayaking from 2001 to 2004, with an increase in 2005 (only data available), whereas SGMA data show a large increase in kayaking participation from 1998 to 2005. OIF data show steady participation in canoeing from 1998 to 2001, an increase in participation in 2001, and then declining in 2002 and again in 2005. SGMA data, however, show canoeing declining from 1998 to 2004 and increasing in 2005, although SGMA data for every year in between are not available. For rafting, OIF data show steady participation from 1998 to 2001, an increase in participation in 2001, and then a decline until 2004, with a slight increase in 2005. SGMA data show declining use from 1998 to 2004 and a slight increase in 2005, although data for every year in between are not available.

The different participation data sets, however, do show some similarities. For one, all participation data sets show canoeing to be the most popular (in terms of the number of participants) of the three activities. Both the Cordell et al. (2004) NSRE and OIF data show that, for many years, the bulk of participation has consistently been 1 to 10 days per year in each of the three activities, and consistently about one-half of the people participate in each activity 1 or 2 days per year. As for whitewater-specific trends, based on the limited sales data and OIF participation data, whitewater kayaking has been the least popular form of kayaking.

Interesting conclusions can also be drawn from individual data sources. Additionally, the number of people participating in kayaking in the Cordell et al. (2004) NSRE data was only about one-third of the number of people participating in canoeing or rafting. According to the OIF data, only about 1 percent of the nation's population over the last 5 years has participated in whitewater kayaking. In terms of co-mingling of participants between activities, it appears from the OIF data that few canoeists, rafters, and kayakers cross over into whitewater kayaking.

4.3.2.2 Estimated Whitewater Boating Participation for Butte County through 2050

As part of the Recreation Demand Study for the relicensing of the DeSabla-Centerville Project, PG&E used activity participation indexes for the Pacific census division in Cordell et al. 1999 (which used NSRE data) and population projections for Butte County to develop non-motorized boating activity participation estimates for the county through the year 2050 (PG&E 2007). Unfortunately, kayaking was not one of the activities

projected. Table 4.3-15 shows Butte County participation estimates for canoeing and rafting/floating from 2006 to 2050.

Table 4.3-15. Butte County annual participation estimates for non-motorized boating activities, 2006-2050.

Activity	2006	2010	2020	2030	2040	2050
Canoeing	6,928	8,514	11,196	15,564	20,318	25,923
Rafting/floating	6,231	7,740	9,796	13,709	18,199	23,643

Note: Participation estimates are based on Pacific census division participation rates.
Source: PG&E 2007.

These two activities ranked 18 and 20 out of 20 activities that were projected, with only about 6,000 current participants and up to 26,000 participants projected to participate in canoeing and rafting/floating. Activities such as walking, visiting a beach or waterside, family gathering, sightseeing, non-consumptive wildlife, picnicking, non-pool swimming, biking, hiking, and fishing had significantly higher participation projections, with at least 40,000 to 100,000 current participants and projecting up to 100,000 to more than 400,000 participants by 2050. These estimates indicate that, on average, 6 to 9 percent of the population of Butte County will participate in canoeing between 2006 and 2050, whereas 2 to 3 percent will participate in rafting/floating (PG&E 2007). The projected increases in participation are driven both by population growth and increased participation rates within that population.

4.3.3 Summary of Demand for Whitewater Boating

As previously stated, participation data specifically for whitewater boating are limited; therefore, the following conclusions regarding demand are based on information for three substitute activities – canoeing, rafting, and kayaking – where whitewater activity information is not available.

In general, whitewater boating is best described as a specialized, niche activity. As such, it is different in its appeal compared to the popular "mass market" activities like hiking and camping, which are participated in by a wide range of people in many locations and variations. For those who do participate in whitewater boating, it is likely that a subset of very active users accounts for most participation days. There is not a large, unmet demand for the activity in California, and activity projections for Butte County do not forecast a large percentage of the county's population participating in canoeing or rafting. Unfortunately, the data sources reviewed were conflicting in regards to recent changes in non-motorized or whitewater boating activity participation; therefore, a definite trend in demand is difficult to identify with confidence.

Participation data sources show relatively low participation in non-motorized and whitewater boating activities, compared to other more popular recreational activities. On a national level, Cordell et al. (2004) estimated that 2 to 10 percent of the country's population participated in the three substitute activities (in fresh water) in 2000-01, and

OIF data show that 5 to 9 percent of the population participated in the three substitute activities in 2005. On a state level, low participation in non-motorized and whitewater boating was demonstrated among 1994-95 NSRE California respondents, and more recently Cordell et al. (2004) NSRE data show only 4 percent of the state's population participating in kayaking and canoeing, and 7 percent participating in rafting. However, the USFS Southern Research Station's NSRE data for the Tahoe National Forest local area did show a slightly higher percentage of the local area participating in all three activities as compared to Cordell et al. (2004) state level data (7 percent for kayaking and canoeing, 11 percent for rafting). In terms of whitewater activity participation among all types of boaters within the state, Strategic Research Group (2003b) data showed low participation by California boaters in whitewater sports (just under 5 percent). Similarly within the canoe and kayaking boating activities, less than 20 percent of these boaters reported participating in whitewater sports.

Participation data also demonstrate that most non-motorized and whitewater boating activity participants only participate a few days a year. Both Cordell et al. (2004) and OIF data show that for many years, the bulk of participation has consistently been 1 to 10 days per year in each of the three substitute activities, with approximately one-half of the people consistently participating in each activity only 1 or 2 days per year. Projections for activity participation in Butte County indicate that a low percentage of the county's population will participate in canoeing and rafting between 2006 and 2050, an average of 6 to 9 percent, compared to other activities such as walking and sightseeing that are forecasted to have 70 percent or more participation rates over the same time period.

Based on a state survey (DPR 2003), it appears there is a moderate level of unmet demand for whitewater boating, as paddle sports, which included all three substitute activities plus rowing and ranked 13 of 55 activities in terms of latent demand. However, in reviewing the survey data for respondents only from Northern California, it was found that the paddle sports activity was not in the top four activities for latent demand.

Unfortunately, the data sets reviewed do not indicate a specific trend in the increase or decrease in participation for the three substitute activities. NSRE data in Cordell et al. (2004) show increasing use in all three activities between 1994-95 and 2000-01; interestingly, OIF data showed 2001 to be the recent peak in participation for canoeing and rafting. The OIF and SGMA data sets differ on the recent participation in activities over the same time period, 1998 to 2005. OIF data show relatively steady participation in kayaking from 2001 to 2004, with an increase in 2005 (only data available), whereas SGMA data show a large increase in kayaking participation from 1998 to 2005. OIF data show steady participation in canoeing from 1998 to 2001, an increase in participation in 2001, and then declining in 2002 and again in 2005. SGMA data, however, show canoeing participation declining from 1998 to 2004 and increasing in 2005, although SGMA data for every year in between are not available. As for rafting,

OIF data show steady participation in rafting from 1998 to 2001, an increase in participation in 2001, and then declining until 2004 with a slight increase in 2005. SGMA data show declining rafting participation from 1998 to 2004 and a slight increase in 2005, although data for every year in between are not available. Based on these discrepancies, a definite trend in non-motorized or whitewater boating use cannot be identified.

4.3.4 User Preferences for a Potential Whitewater Facility in the Project Area

A whitewater park was among the ideas for future development in the Oroville area, brought forward by stakeholders in the Oroville Facilities Relicensing Collaborative (from 2001 to 2006). A whitewater park is a designated segment of water that has whitewater run qualities (i.e., rapids) where whitewater activities such as rafting and kayaking, including slalom and/or rodeo boating, take place. Whitewater parks can be in either augmented, natural whitewater runs, or in man-made runs. These parks often involve more than a stretch of water; the land adjacent to the whitewater run can be improved to include trails, land parks, and areas for spectators to watch the boaters. The whitewater boating focus group discussion and survey conducted in 2003 as part of Oroville Facilities Relicensing Study R-16 generated preliminary ideas for potential park features, usage, and locations.

4.3.4.1 Focus Group's Preferences for Features of a Potential Whitewater Park in the Oroville Area

The focus group had several ideas on what a whitewater park in the Oroville area might contain in terms of both whitewater activities and land-based support facilities. Members of the focus group indicated that a park in the Oroville area could provide a combination of whitewater activities, primarily slalom and rodeo boating. Slalom boating requires passing through gates in a specific order, either moving upstream or downstream. Rodeo boating is more performance and show-oriented, and involves boaters remaining in a river hydraulic feature or "play hole" and doing flips, spins, and twists for a period of time (Figure 4.3-5). Focus group members cited parks in Augsburg, Germany; Sydney/Penrith, Australia; and Durango, Colorado, as examples of other park locations where slalom and rodeo boating are both provided in the same park. Commercial rafting at the whitewater park could also be included as an activity for people who do not otherwise participate in whitewater activities. Focus group members felt that the whitewater park could be designed for all levels of whitewater experience.

Focus group participants indicated that non-whitewater activities such as fishing and boating could still take place on waters within the park. In addition, focus group members mentioned diverse activities such as picnicking and Frisbee as activities that could take place on the shore around the whitewater park. Facilities such as walking trails, bike paths, horseback riding trails, campgrounds, restrooms, and food concessions could also be included in the park. In addition to these activities, focus group members mentioned the importance of spectators and felt that it was important to

have contests, demonstrations, and classes the public could watch, as well as an area provided for them to do so.

Figure 4.3-5. Example of rodeo boating.
Source: Northeastern Whitewater USA website.

Other activities or events that focus group members listed in the survey included a surf wave (see the Glossary for a definition), a festival, whitewater awareness events, safety training including swift water rescue, and "whatever makes it economically viable." Focus group members felt that the desires of potential park users should be studied, along with the economic feasibility of such a facility in the Oroville area, and that any facility should ultimately provide the most-desired features.

4.3.4.2 Focus Group's Opinions on Potential Usage of and Demand for a Whitewater Park

To obtain a preliminary estimate of the level of demand for a potential whitewater park, focus group members were asked, "What level of regular use do you think such a whitewater park would receive?" Out of 11 participants, nine thought a potential whitewater park would have a high amount of use, and two participants thought it would receive a medium amount of use.

The reasons for high use estimates were the park's location and time of use. Several participants commented that there are many local paddlers in the area who would use the park. Because of the park's convenient location, participants felt that paddlers could visit the park after work and boat without a partner, which is generally considered unsafe. Because of the location of the park, however, focus group participants felt that there would be a high probability of other people boating at the same time, relieving the need to boat with a partner. The park would also be close to amenities in the City of Oroville; to Chico State University, which could use the park for classes and trips; and

near other whitewater opportunities being enhanced in areas undergoing hydro-relicensing. Participants felt that enhancing whitewater opportunities on the Big Bend run in conjunction with the whitewater park could also contribute to high use of the park. Two participants commented on the timing of use at the park, remarking that as spring flows decrease, there are limited whitewater opportunities in California, and the park would offer regular whitewater recreation when few other opportunities existed. One participant felt this would contribute to high use from summer to late fall. During the discussion, focus group members concluded that peak use would be in July, August, and September, with use declining in the winter because of colder weather. (See Appendix B for a discussion of whitewater runs available in Northern California during different seasons.)

Of the two participants who felt the park would receive medium use, only one gave a reason. This participant felt use would depend on design; if the park were designed similar to the one in Penrith, Australia, a regular rafting operation could be feasible that would boost use by non-whitewater recreationists.

Focus group members estimated that there would be as many as 300 to 500 visitors per day at the park on a weekend, provided that the park was developed in conjunction with improvements to the Big Bend run. (As of 2008, a shuttle service for paddlers using the Big Bend run is offered by a Lake Oroville marina [American Whitewater 2008d]). Focus group members indicated that there is a need to gather information from other whitewater parks to better determine what usage could be expected at a whitewater park in Oroville.

In terms of focus group member usage of a potential whitewater park in the Oroville area, the survey asked, “How often would you use such a whitewater park?” Table 4.3-16 lists the response choices and the results. Most participants would visit the park either once a week or more, or once every 2 weeks. Only one individual’s usage would depend on the entry fee. Additionally, one participant wrote in that usage would be based on the level of skill required.

Table 4.3-16. Focus group participants projected individual use of a potential whitewater park in the Oroville area.

Amount of Use	Number of Participants
Once a week or more	6
Once every two weeks	3
Once a month	0
Once every two months	0
Less than once every 2 months	0
Depends on entry fee	1
Written-in response: Depends on the level of skill required	1

Note: N=11.
Source: DWR 2004.

Focus group members also thought that non-whitewater recreationists would be attracted to the park. They felt the park would be an additional recreation site for people visiting Oroville, and would set Oroville apart from other reservoir-based recreation sites in the surrounding area. Focus group members felt that non-whitewater visitors could attract commercial rafting and spectators for whitewater activities and events.

4.3.5 Potential Whitewater Park User Characteristics

The characteristics of visitors who would likely come to a whitewater park are influenced by the features of the park, the range of activities and boating difficulty available at the park, as well as the demographics, non-motorized boating participation, and interest among the population in the primary market area, among other factors. Other than boating participation, these factors are not known in relation to a potential whitewater park in the Project area or region. However, demographic information about those who currently participate and who historically have participated in non-motorized boating activities, drawn from the same sources that provided non-motorized boating participation data (i.e., NSRE), is available at the national and regional levels. These data provide an indication of the broad characteristics of people who have participated in non-motorized boating activities that might be available at a whitewater park in the Project area or region, and who therefore could comprise the users of the potential park.

4.3.5.1 National Demographics for Non-Motorized Boaters

OIF data provide demographic information for participants in canoeing, rafting, and kayaking (Table 4.3-17). In 2005, the majority of canoeists were male, over one-half were married and had children under 18 years old, and over one-quarter were age 45 or older. The vast majority of canoeists were white (i.e., Caucasian), and most had household incomes over $40,000. Rafting participants in 2005 had somewhat different demographics. Like canoeists, many rafters were male and white; however, less than half were married, but one-half had children under 18 years old. Age varied between the two activities as well, with less rafters age 45 or older and a larger percentage between the ages of 16 and 24 compared to canoeists. Similar to canoeists, rafters in 2005 primarily had household incomes of $40,000 or more. Unlike canoeists, however, one-third of rafters were from the Western region compared to only 14 percent of canoeists. As for kayakers, demographics in 2005 were fairly balanced across most categories, apart from ethnicity and household income. Gender was fairly well balanced as was marital status. Over one-quarter of kayakers were age 45 or older, and 31 percent were between 16 and 24 years old. As with the other two activities, kayakers were mainly white and had household incomes of $40,000 or more, and one-half had children under 18 years old.

In the American Whitewater Accident Study (Plyler 2006), Rich Bowers, Past Executive Director, stated that more than one-third of American Whitewater members paddle between 25 and 50 days a year, with over one-quarter paddling more than 50 days a year. NSRE data in Cordell et al. (2004) specifically describe these most active participants in non-powered boating activities as “enthusiasts.” To qualify as an

enthusiast for canoeing or kayaking, one must participate in the activity a minimum of 5 days a year, and for rafting, a minimum of 4 days a year.

Table 4.3-17. National demographic characteristics of non-motorized boating activity participants, 2005.

Demographics	Canoeing Participants (%)	Rafting Participants (%)	Kayaking Participants (%)
Gender			
Male	62	63	55
Female	38	37	45
Age			
16-24	26	39	31
25-34	19	16	20
35-44	25	23	21
45+	29	22	28
Marital Status			
Married	56	46	54
Unmarried	44	54	46
Ethnicity			
White	85	82	89
African-American	4	4	3
Hispanic	7	10	8
Asian	2	1	2
Other	7	9	4
Children under 18			
Yes	52	53	51
Household Income			
<$40,000	26	20	24
$40-79,000	39	41	33
$80,000+	36	39	44

Source: OIF 2006.

NSRE data show that in 2000-01, very few Americans were considered enthusiasts in these three activities; however, these small percentages of the nation's population contributed the majority of participation days to all three activities (Table 4.3-18).

Table 4.3-18. Participation in non-motorized boating activities by enthusiasts, 2000-01.

Activity	Percent of Population who are Enthusiasts	Percent of Total Participation by Enthusiasts
Kayaking	1.2	84.2
Rafting	2.9	72.7
Canoeing	3.2	80.5

Note: Participants were age 16 and older.
Source: Cordell et al. 2004.

Cordell et al. (2004) also provide NSRE demographic data on enthusiasts. For canoeing enthusiasts, most are male, white, and live in metropolitan areas (Table 4.3-

19). Kayaking and canoeing enthusiasts were similar, as most of each group are male, white, and live in metropolitan areas. Also, more than half of both groups earn $50,000 or more, and about 60 percent of each group is in either the 25 or under or 45 or older age groups. Rafting enthusiasts were somewhat different than enthusiasts for the other two activities (apart from ethnicity and residence) in that only about 40 percent were male or earned $50,000 or more. Additionally, unlike the other two activities, nearly one-half of rafting enthusiasts were age 25 or under while relatively few were age 45 or older.

Table 4.3-19. Demographic characteristics of non-motorized boating enthusiasts, 2000-01.

Activity	% Male	% White/ non-Hispanic	% Age 25 or Under	% Age 45 or Older	% Earning $50,000 or More	% Living in Metropolitan Areas
Canoeing	61.6	90.2	30.5	30.4	55.4	77.8
Rafting	40.6	90.3	44.8	12.6	39.2	78.7
Kayaking	63.6	88.3	32.4	27.7	63.4	81.6

Note: Participants were age 16 and older.
Source: Cordell et al. 2004.

Cordell et al. (2004) also provide NSRE data regarding demographic information on "ultra-enthusiasts," those enthusiasts in the upper 50 percent in participation days (Table 4.3-20). Ten days of kayaking a year is the minimum for a kayaking ultra-enthusiast (twice the enthusiast threshold), 9 days a year for canoeing (almost double the enthusiast threshold), and 6 days a year for rafting (50 percent above the enthusiast threshold). Data show that kayaking ultra-enthusiasts were demographically similar to other kayaking enthusiasts, although slightly less were age 25 or under (27.4 percent ultra-enthusiasts vs. 32.4 percent enthusiasts) or live in metropolitan areas (77.3 percent vs. 81.6 percent). Likewise, canoeing ultra-enthusiasts were similar demographically to other canoeing enthusiasts. Rafting ultra-enthusiasts differ only slightly from their enthusiast counterparts in demographics, with a higher percentage of white participants (93.4 percent vs. 90.3 percent), and slightly fewer earning $50,000 or more (34.7 percent vs. 39.2 percent), living in metropolitan areas (73.7 percent vs. 78.7 percent), and less male participants (36.9 percent vs. 40.6 percent).

Table 4.3-20. Demographic characteristics of non-motorized boating ultra-enthusiasts, 2000-01.

Activity	% Male	% White/ Non-Hispanic	% Age 25 or Under	% Age 45 or Older	% Earning $50,000 or More	% Living in Metro. Areas
Canoeing	63.1	91.4	32.4	31.9	55.8	75.5
Rafting	36.9	93.4	45.8	11.1	34.7	73.7
Kayaking	62.3	88.3	27.4	29.2	62.7	77.3

Note: Participants were age 16 and older.
Source: Cordell et al. 2004.

4.3.5.2 Regional Demographics for Non-Motorized Boaters

NSRE data have also been analyzed by USFS Region (USFS 2006a), making available demographic data from the 2000-2004 NSRE for Region 5 for rafting, kayaking, and canoeing participants (Table 4.3-21). (Region 5 includes California, Hawaii, and the Pacific island territories, but more than 95 percent of the region's population resides in California.) These data indicate only slightly higher participation by the youngest boaters (those under 35 years of age) as compared to those in the middle age group (35 to 54 years of age). Comparing the three activities, rafting had more participation by people age 16 to 34 and age 35 to 54 than the other two activities. All activities were participated in by approximately 3 percent of the Region 5 population age 55 or older.

Table 4.3-21. USFS Region 5 percentage participation in non-motorized boating by people age 16 and older (by age group), 2000-04.

Activity	Age 16-34 (%)	Age 35-54 (%)	Age 55+ (%)	All Ages (%)
Rafting	10.2	8.9	3.1	7.8
Kayaking	7.7	6.4	3.1	6.0
Canoeing	6.6	6.2	3.0	5.5

Source: USFS 2006a.

4.3.5.3 Summary of Demographics for Non-Motorized Boaters

Although Cordell et al. (2004) NSRE demographic data focused on a specific set of canoeing, rafting, and kayaking users, the enthusiasts, and different years than the OIF data, these two data sets can be generally compared to determine any potential similarities between enthusiasts (NSRE data) and all activity participants (OIF data), assuming there have not been substantial demographic shifts between 2001 and 2005. Both canoeing and kayaking enthusiasts and general participants were generally white, male, and had moderate to high household incomes. Additionally, about one-third of kayaking enthusiasts and general participants were young, age 25 and under, and roughly 30 percent of both kayaking and canoeing general participants and enthusiasts were age 45 or older. General rafting participants and enthusiasts were both generally white, and more than one-third were age 25 or under. Rafters had more variation between gender and income between general participants (mainly males and middle to high income) and enthusiasts (mainly women and lower income). Similar to 2005 nationwide boating participation data, the 2000-2004 NSRE data also showed that in the USFS Region 5, rafting had the highest percentage of participants in the 16 to 34 age group, followed by kayaking and then canoeing.

Interesting single data set conclusions can also be drawn from these sources. According to NSRE data in Cordell et al. (2004), one-third of the nation's rafting, kayaking, and canoeing participants in 2000-01 were enthusiasts, who contributed almost three-quarters or more of the total participation days for each activity. Additionally, most enthusiasts for all three activities in 2000-01 were living in metropolitan areas. Ultra-enthusiasts, the highest-participating subset of enthusiasts, were demographically similar to other enthusiasts in all three activities. OIF data, unlike

the Cordell et al. (2004) NSRE data, include information on region of origin. According to the 2005 OIF data, few canoeists were from the west (14 percent), compared to one-third of rafters and one-quarter of kayakers.

4.3.5.4 Trends in Non-Motorized Boater Demographics

General current demographic trends have been identified through OIF data from 1998 to 2005 for canoeing, rafting, and kayaking (data from 2001 to 2005 only). Ethnicity data are limited to 2003 to 2005 for all three activities. For canoeing, participant gender was generally a 55/45 split male/female, until 2001 when the percentage of male participants began increasing to more than 60 percent. For canoeists, marital status has been fairly evenly split between married and unmarried or a 55/45 split either way. For ethnicity, canoeing participants have been predominately white; however, Hispanic participation has increased. The percentage of canoeists in the middle household income bracket ($40,000 to $79,000) has decreased since 2001, while the percentage in the higher household income bracket ($80,000+) has increased. Finally, over the last 8 years, about 15 to 20 percent of canoeists have been from the Western region.

As for rafting participants, generally around 40 percent have been between the ages of 16 and 24, with around 20 percent of participants in the other three age brackets (25 to 34, 35 to 44, and 45+). The gender split for rafters has been around 60/40 male/female, although closer to 50/50 in 1999 and 2000. Approximately 60 percent of rafting participants were unmarried from 1998 to 2002; in 2003, this percentage began decreasing, reaching 54 percent by 2005. Most rafting participants have been white, although African American participation has increased from 5 percent in 2003 to 10 percent in 2005. As with canoeists, the percentage of rafters in the middle household income bracket has decreased since 2001, while the percentage in the higher household income bracket has increased. Lastly, approximately one-third or less of rafting participants have been from the Western region over the last 8 years.

In general, more than one-third of kayaking participants have been between the ages of 16 and 24, although this percentage dropped to 31 percent in 2005. The gender split for kayakers was 60/40 (men/women) from 2002 to 2004, but the percentage of men decreased to 55 percent in 2005. More than one-half of kayaking participants have been unmarried until 2005 when only 46 percent were unmarried. As with the other two activities, kayaking participants have been predominately white; however, there has been a slight increase in Hispanic participation. As for household income, the percentage of kayaking participants in the middle income bracket decreased from 2001 to 2002 and from 2003 to 2005, with generally the opposite effect on the higher income bracket. In general, approximately 30 percent of kayaking participants were from the Western region in 2001 and 2002; from 2003 to 2005, this percentage has decreased to approximately 25 percent.

Trends regarding high participation users, the enthusiasts, are provided in Cordell et al. (2004) using NSRE 1994-95 and 2000-01 data (Table 4.3-22). For canoeing, the

percentage of the population classified as enthusiasts has risen, as has the minimum number of days to be an enthusiast and the percentage of total participation days attributed to enthusiasts. The percentage of canoeing enthusiasts in the 16 to 24 age bracket has decreased, while the 25 to 49 age bracket has increased. Like canoeing, the percentage of the population classified as enthusiasts for kayaking has risen, as has the percentage of total participation days attributed to enthusiasts. The minimum number of days to be a kayaking enthusiast has remained the same. The major change in percentage of kayaking enthusiasts by age has been in the 25 to 49 age bracket, which has substantially decreased, while the 50+ age bracket has substantially increased. Like the other two activities, the percentage of the population classified as rafting enthusiasts has increased; however, the percentage of total participation days attributed to enthusiasts has slightly decreased. As with kayaking, the minimum number of days to be a rafting enthusiast has remained the same. As with canoeing, the percentage of rafting enthusiasts in the 16 to 24 age bracket has decreased, while the 25 to 49 age bracket has increased slightly. Additionally, the 50+ age bracket has also slightly increased.

Table 4.3-22. Trends in enthusiast participation in non-motorized boating activities, 1994-95 to 2000-01.

Activity	% of Population Classified as Enthusiasts		Minimum Days/Year to Qualify as Enthusiast		% of Total Participation Days by Enthusiasts		% of Enthusiasts by Age Group					
							16-24		25-49		50+	
	94-95	00-01	94-95	00-01	94-95	00-01	94-95	00-01	94-95	00-01	94-95	00-01
Canoeing	1.8	3.2	4	5	73	80.5	27.6	19.7	49.4	56.0	23.1	24.3
Rafting	1.9	2.9	4	4	75	72.7	37.1	32.9	55.5	57.1	7.5	10.0
Kayaking	0.2	1.2	5	5	78	84.2	22.5	20.3	71.3	54.0	6.2	25.7

Note: Participants were age 16 and older.
Source: Cordell et al. 2004.

In terms of general activity participants, some notable trends in the OIF data include shifts into the upper household income bracket for canoeing and rafting participants, an increase in African American participation in rafting, a decrease in kayaking participation by people under the age of 25, and the decrease in the percentage of kayaking participation from the Western region. As for enthusiasts, Cordell et al. (2004) NSRE data show an increase in the percentage of the nation's population that are canoeing, kayaking, and rafting enthusiasts, accounting for an increased percentage of participation days in canoeing and kayaking and accounting for a decreased percentage of participation days in rafting. There also appear to be some potential shifts in the ages of enthusiasts in the three activities, most notably in kayaking. For canoeing and rafting, decreases in the youngest age bracket and increases in the middle and older age brackets could indicate the aging of younger participants and lack of young replacement participants. As for kayaking, the large shift from participants in the middle age bracket to the older age bracket may indicate that kayakers are aging and

continuing to kayak as they get older, but are not being replaced by participants in the middle age group or younger participants getting older and moving to the middle age bracket.

4.4 EXISTING AND PROPOSED WHITEWATER BOATING PARKS IN THE UNITED STATES

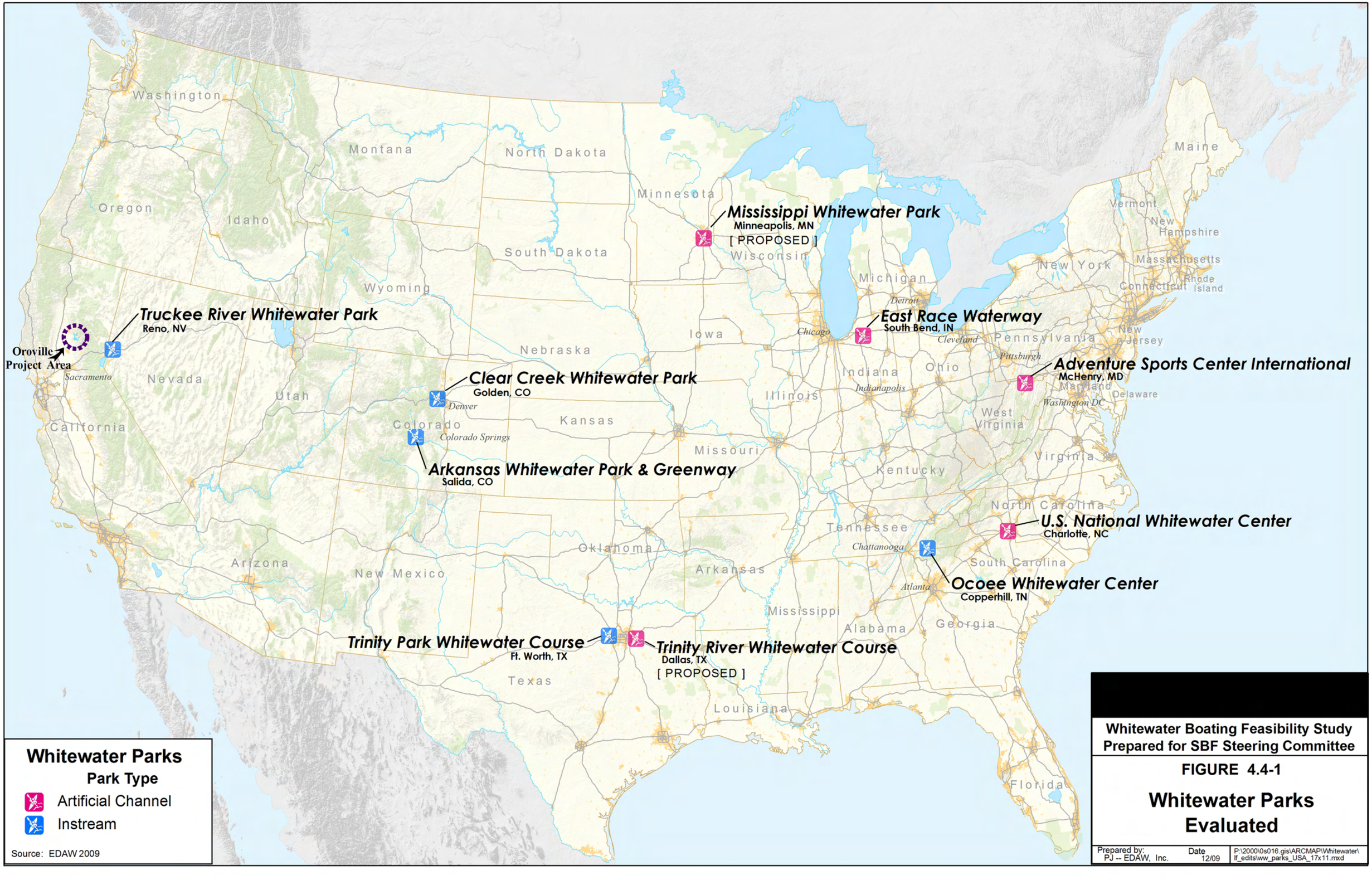
To identify the range of whitewater boating facilities that exist and understand the key features and aspects of these facilities, several existing whitewater parks were examined. A description of the parks is provided below, based on the type of park: instream or artificial channel.

Instream whitewater parks are typically created by placing man-made structures within an existing natural channel. These structures constrict and direct water flow and thus create flow conditions attractive to whitewater boaters, with waves, pools, drops, and eddies. These structures may be constructed of native or non-native natural materials such as boulders and rock slabs, which are typically fixed in place with cement grout, or with engineered cement barriers.

Artificial channel whitewater parks are constructed in an existing canal or flume, in an artificial channel created adjacent to a natural or existing artificial channel, or with an artificial channel unconnected to a natural channel. Like whitewater parks created in a natural channel, artificial channel parks use boulders fixed in place or man-made barriers (of cement, fiberglass, or other man-made materials) to create the desired flow characteristics. These barriers may be designed to be movable to allow changes in the flow characteristics. The artificial channel park may use water diverted from an existing channel or may use water pumped from another source, with pumps used to recirculate the water from the pool at the end of the park's whitewater run/course to an elevated pool at the start of a park's course. Figure 4.4-1 depicts the location of the whitewater parks evaluated. Images and site plans of these facilities are included as Appendix C.

4.4.1 Instream Parks

Five instream parks in the United States were researched (Figure 4.4-1 and Table 4.4-1). All five are public parks that opened between 1996 and 2004. The parks range in length from 1/4 to 1/2 mile and range in construction cost from $150,000 to $25 million. Most of the parks are Class II or Class III, with one more difficult Class III-IV course. More than one-half of the parks also provide other facilities, primarily for hosting events. Some of the parks host festivals or other events such as local, regional, national, or Olympic Games paddling competitions. All five parks are open year round, but seasonal usage often depends on river flows. All are free for paddlers to use, although there is a parking fee at the Ocoee Whitewater Center (paddlers often launch upstream of the course, and there is no launch fee).



Whitewater Boating Feasibility Study
Prepared for SBF Steering Committee

FIGURE 4.4-1

Whitewater Parks Evaluated

Prepared by:	Date	
PJ -- EDAW, Inc.	12/09	P:\2000\0s016.gis\ARCMAP\Whitewater\lf_edits\ww_parks_USA_17x11.mxd

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Table 4.4-1. Summary of characteristics of U.S. instream parks researched.

Park Name & Location	Owner/ Operator	Date Opened	Commercial or Public Use	Approx. Length of Run(s)	Type of Boating Allowed	Difficulty Class	Construction Cost
Truckee River Whitewater Park at Wingfield (Reno, NV)	City of Reno	2003	Public	2,600 feet (2 channels)	kayaking, rafting, canoeing, tubing, riverboarding	Class II to III	$1.5 million
Clear Creek Whitewater Park (Golden, CO)	City of Golden	1998	Public	1/2 mile (competition course is 800 feet)	kayaking, rafting, canoeing, tubing, riverboarding	Class II+	$342,000
Arkansas Whitewater Park and Greenway (Salida, CO)	City of Salida & Arkansas River Trust	2001	Public	1/4 mile	kayaking, rafting, canoeing, tubing, riverboarding	Class II+ to III	Unknown
Ocoee Whitewater Center (Copperhill, TN)	U.S. Forest Service	1996	Public	1/3 mile	kayaking, rafting, canoeing	Class III to V	$25 million ($7.7 million for river alterations)
Trinity Park Whitewater Course (Ft. Worth, TX)	City of Ft. Worth	2004	Public	1/2 mile (primary section containing enhance-ments)	kayaking, rafting, canoeing, tubing, riverboarding	Class II and III	$150,000

Sources: City of Reno 2007, Ripboard Inc. 2008a, Ripboard Inc. 2008b, City of Golden 2008, Boulder Outdoor Center 2008a, Boulder Outdoor Center 2008b, Austin 2005, arkpaddler.com 2008, Arkansas River Trust 2006, USFS 2008, American Whitewater 2008b & 2008c, Shimoda and Paddler Editors 2005, Tinsley 2004, and Jones 2004.

4.4.1.1 Truckee River Whitewater Park at Wingfield

Located in downtown Reno, Nevada, the Truckee River Whitewater Park at Wingfield was opened in 2003. This public park, developed by restoring two existing channelized sections of the river, provides runs totaling 2,600 feet. The two runs (1,400 and 1,200 feet) contain 11 drop pools with Class II and III rapids and are used for kayaking, rafting, canoeing, and tubing (City of Reno 2007) as well as the new activity of riverboarding (Ripboard Inc. 2008b). The park is dependent on natural flows, and so was designed to accommodate low-water flows to ensure usability during dry spells, and has been modified to be universally accessible (NCPAD 2006). The year-round course cost $1.5 million to construct, while the total cost of improvements including a grassy park with an amphitheater and facilities for concerts, festivals, picnics, and outdoor sports was $4.5

million (City of Reno 2007). A New Years Day 2006 flood damaged the whitewater park, necessitating repairs costing several hundred thousand dollars (Associated Press 2006).

Park users include those visiting downtown Reno (several hotel-casinos offer lodging and kayak rental packages) (Jones 2004), as well as professionals who train at the park. Use of the park is free of charge. The City of Reno owns the park, and the State of Nevada manages the river bottom and banks; construction of the park was funded by statewide bonds approved by voters (City of Reno 2007). The annual Reno River Festival is held at the park and hosted more than 37,000 visitors in 2008 during the event's 3-day run (Northern Nevada Business Weekly 2008). The event includes kayaking competitions and demonstrations as well as opportunities for kayaking instruction and numerous land-based activities and entertainments (Reno-Sparks Convention and Visitors Authority 2007). The City of Reno is currently considering a several million dollar extension of the whitewater park, potentially as part of an "eco-channel" enhancement to the Truckee River that would improve water quality and aquatic habitat, particularly during low-flow periods (City of Reno 2008).

4.4.1.2 Clear Creek Whitewater Park

The Clear Creek Whitewater Park is located in Golden, Colorado, and opened in 1998 (Boulder Outdoor Center 2008a). This public park is one-quarter mile long, consisting of an 800-foot competitive course and a six-drop addition completed in 2002 (City of Golden 2008). The $342,000 park (Austin 2005) provides Class II+ rapids for kayaking, canoeing, and tubing. The course contains three sections; the top has drops and pools for different experience levels and some fast eddies, the middle has surf waves with large boulders, and the bottom has more extreme surf and wave drops (City of Golden 2008). Opportunities for riverboarding are also available, along with summer lessons in the sport. Depending on seasonal runoff, the park experiences peak boating flows in late May and early June of 1,000+ cubic feet per second (cfs) for Class II+ rapids. Lower flows and higher water temperatures are typical by July and August and are more conducive to tubing (Ripboard Inc. 2008a). Access to the creek is open, and there is no fee to use the park.

An economic impact study completed in 2000 estimated that about 14,000 people used the whitewater course each year, with as many as 175 people using the course on summer weekend days (Stratus Consulting 2000). In addition, the Clear Creek Whitewater Park has hosted several events, including the Clear Creek Whitewater Festival, Open Canoe Championships, Junior Olympic Championships, and the Eddie Bauer Invitation (City of Golden 2008). The park also hosts a rodeo event every Wednesday night in June (Ripboard Inc. 2008a).

4.4.1.3 Arkansas Whitewater Park and Greenway

Opened in October 2001, the Arkansas Whitewater Park and Greenway is located in Salida, Colorado, and was developed by the Arkansas River Trust (Arkansas River

Trust 2006). This public whitewater park is one-quarter mile long with two play holes for boaters. The park is open year round (Bardstown Boaters 2008), but difficulty is flow dependent. The park provides a Class II+ to Class III experience at flows of 200 to 1,200 cfs for whitewater boating activities, including riverboarding (Boulder Outdoor Center 2008b). Although the river flow is less than 1,000 cfs for most of the year, flows can be as high as 6,000 cfs during the summer runoff period (FIBArk 2008). There is no fee to use the park.

The park hosts the annual FIBArk Festival (First in Boating on the Arkansas), the longest running whitewater downriver race in the United States (Bardstown Boaters 2008, FIBArk 2008). Phase 2 improvements, completed in 2003, included tying the existing city park to the greenway project through a large bank enhancement effort. Instream improvements include a new intermediate level play hole (Bardstown Boaters 2008). The initial phase of improvements was accomplished with donated materials and labor. Phase 2 improvements were funded with $50,000 from the City of Salida and nearly $30,000 in private donations. Planning and fundraising is underway for Phase 3, which will include both riverbank and instream improvements (Arkansas River Trust 2006).

4.4.1.4 Ocoee Whitewater Center

The oldest of the five instream parks researched, the Ocoee Whitewater Center in Copperhill, Tennessee, was built for the 1996 Olympics. This USFS-managed multiple-use recreational and educational complex provides a 500-meter long Class III to Class IV experience for whitewater rafters, canoeists, and kayakers (USFS 2008, American Whitewater 2000). Although open year round, the center is dependent on flows from upstream reservoirs controlled by the Tennessee Valley Authority (TVA). Whitewater activities occur during weekends between May and September when scheduled flow releases boost river levels for 5 to 8 hours each of 34 release days (TVA 2008). Under the 2007 flow release agreement, which provides for scheduled flow releases for 12 years, rafting outfitters pay TVA for the water released (Rafting News 2007). More than 20 commercial rafting outfitters operate on the river under special permit by the USFS (MDNR 2006).

The park receives approximately 300,000 visitors a year. However, prior to the 2007 flow release agreement, limited flows reduced use of the course by the public and for whitewater events. In addition to whitewater boating, the facility provides opportunities for wildlife viewing, picnicking, hiking, biking, and environmental education, including a native garden and geology tours. A nature-oriented gift shop and large visitors center are also located at the park. There is a $3.00 all-day user fee for parking at the center and access to the picnicking sites and trails on adjacent USFS property. The Ocoee Whitewater Center hosted the 1996 Olympic canoe and kayak slalom competitions, the first time these events were held in a natural river (USFS 2008), and the 2000 American Whitewater Ocoee Rodeo (American Whitewater 2000).

4.4.1.5 Trinity Park Whitewater Course

The Trinity Park Whitewater Course was opened in 2004 in Fort Worth, Texas, on the Clear Fork of the Trinity River (Tinsley 2004) within the city-owned Trinity Park (Jones 2004). The Class II to Class III course provides 1/2 mile of public instream whitewater boating (kayaking, rafting, canoeing, riverboarding) (Tinsley 2004, Jones 2004, Ripboard Inc. 2008b). The focus of the course is three chutes that were added to existing low-head dams on the lower one-half-mile of the cement-channelized river by the Tarrant Regional Water District during repair of the dams (American Whitewater 2008b). The addition of the whitewater chutes added $150,000 to the cost of the dam repairs (Tinsley 2004). At a fourth dam, large flat rocks were added at the top as stepping stones to allow pedestrians to cross the river (a paved walking and biking trail parallels the river through the park).

At lower water levels (roughly 100-250 cfs), the park is described as good for novice kayakers and is also used by rafters and tubers. When the flows exceed about 750 cfs, following rains, the park is better for more experienced boaters. Paddlers claim that the best waves form at some of the chutes at flows in the 2,000-2,650 cfs range (Tinsley 2004, American Whitewater 2008b). The most popular of the chutes is used as a "park and play" spot by kayakers. A nonprofit organization sponsors kayaking clinics at the course (Streams and Valleys, Inc. 2008). Although the course is in an urban area close to downtown Fort Worth, Trinity Park provides visitors with a large woodland area, picnic groves, and playgrounds. There is no fee to use the course.

4.4.2 Artificial Channel Parks

Five artificial channel parks in the United States were researched, three of which are built and two of which are proposed (Table 4.4-2). The parks are located in several regions of the country and are all multi-million dollar facilities. Two of the existing artificial channel parks are commercial operations that opened in just the past few years, and generally provide Class II to Class IV boating opportunities. The third is a much older facility operated by a municipal parks department in Indiana. All but one of the investigated parks provide (or propose to provide) additional non-whitewater boating facilities. One of the existing parks is an Olympic training site, and the two proposed parks would be designed to accommodate Olympic events.

A summary of the boating and other fees charged at the artificial channel parks is provided in Appendix D. A summary of the financial characteristics information obtained to date for the two recently built (2006, 2007) artificial channel parks is provided in Appendix E.

Table 4.4-2. Summary of characteristics of U.S. artificial channel parks researched.

Park Name & Location	Owner/ Operator	Date Opened	Commercial or Public Use	Run Length	Type of Boating	Difficulty Class	Cost
East Race Waterway (South Bend, IN)	City of South Bend	1984	Public	1,900 ft	rafting, kayaking, canoeing	Class II-III	$5 million
U.S. National Whitewater Center (Charlotte, NC)	U.S. National Whitewater Center, Inc. (nonprofit 501(c)(3))	2006	Commercial	4,000 ft (total of 3 channels)	rafting, kayaking, canoeing, riverboarding	Class II-IV	$38 million
Adventure Sports Center International (McHenry, MD)	Adventure Sports Center International, Inc. (nonprofit 501(c)(3))	2007	Commercial	1,700 ft	rafting, kayaking, canoeing, riverboarding	Class II-IV	$24 million
Mississippi Whitewater Park (Minneapolis, MN) (a)	State of Minnesota (key property owner)	Proposed	Public	1,650 to 2,580 ft (3 alterna-tives)	kayaking, rafting, canoeing	Varying levels	$26 million (estimate)
Trinity River Whitewater Course (Dallas, TX) (b)	City of Dallas	Proposed	Public	2,000 ft	kayaking, rafting, canoeing	Varying levels	$20.2 million (estimate)

Sources: South Bend Parks and Recreation Dept. 2008, Smage 2000, U.S. National Whitewater Center 2008, Maley 2007, Ripboard Inc. 2008b, Ruggiero 2007, ASCI 2007, Mississippi Whitewater Park Development Corporation 2003b and 2004, City of Dallas 2006, 2008a, 2008b.

(a) As of 2006, the proposed park is undergoing a redesign and new economic assessment, after issues with the original design arose early in the environmental permitting process.

(b) Initial plans from 2005 included a multi-channel artificial channel whitewater park and an instream "standing wave structure" at another location within the Trinity River Corridor. Recent documents list the whitewater park as unfunded and delete it from the official conceptual plan, although an outlet channel with potential for kayak and canoe use with appropriate design remains at the proposed site. The standing wave structure (now expanded to two structures a short distance apart) is scheduled for construction in 2009.

4.4.2.1 East Race Waterway

Opened in 1984, the East Race Waterway on the St. Joseph River in South Bend, Indiana, was the first man-made whitewater kayaking and rafting course in the country (South Bend Parks and Recreation Dept. 2008). The course is 1,900 feet long with about a 12-foot drop and flows of 450-500 cfs. The East Race Waterway provides Class II-III difficulty, with several rocks, ledges, and submerged walls creating waves, drops, and play features (Smage 2000). The course is operated by the South Bend Parks and Recreation Department and is open to the public on summer weekends only.

The parks department rents inflatable kayaks and two-, four-, and six-person rafts for a fee of $4 per person per trip and provides a trained rescue team stationed along the course. Private kayakers and canoers who pass a brief water test (to ensure they have the basic skills to use the course safely) are also permitted on the course and pay a daily $12 fee. A local paddling club has arranged to have use of the course on weekdays and during the off-season (East Race Whitewater Kayak Club 2007).

The facility, constructed from an existing mill race (Chicago Area Paddling and Fishing Guide 2008), was originally built primarily for whitewater slalom kayaking, and has hosted national competitions (American Whitewater 2008a). The course cost $5 million to build and was financed with a grant and local bonds (South Bend Parks and Recreation Department 2008).

The course draws users from the surrounding communities of South Bend and Mishawaka, Indiana (with a population of approximately 150,000), as well as nearby cities, including Chicago (Chicago Whitewater Association 2008), which is about a 2-hour drive away. South Bend is home to several universities and colleges, and college students comprise a core segment of the visitors to the course (City of South Bend 2009). The course is in an urban setting and is integrated into South Bend's Riverwalk and riverfront park system. The adjacent paved walkways provide ample opportunity for spectators to view competition events and daily recreational use

4.4.2.2 U.S. National Whitewater Center

Located outside Charlotte, North Carolina, the U.S. National Whitewater Center (USNWC) was opened in August 2006 and is billed as the world's largest artificial channel whitewater park. This commercial facility consists of two main channels, one of which divides for a stretch into "instruction" and "freestyle" channels, flowing from an upper to a lower pond. The vertical drop between the two ponds is 21 feet. The total length of the channels is about 4,000 feet. A maximum flow of 1,250 cfs is pumped into the 50- to 60-foot wide concrete channels with a variety of movable rapids and wave-shaping fixtures, providing a Class II to Class IV paddling experience. The facility includes a conveyor belt that returns boaters to the upper pond without leaving their boats (USNWC 2008, Whitmire 2006). Visitors may use their own kayaks or whitewater canoes, or may participate in guided whitewater rafting and kayaking instruction for

which boats are provided. In addition, the newer sport of riverboarding can be enjoyed at the park on certain days by visitors with their own equipment. Inflatable boats are not allowed (USNWC 2008, Ripboard Inc. 2008b).

The $38 million facility (Maley 2007) is an official Olympic training site and is used by both individuals and groups as well as for international events (USNWC 2008). In 2008, the center hosted the U.S. Olympic team trials for slalom and canoe/kayak, along with four other international paddling events (McQuaid 2007).

Flat-water paddling access to the Catawba River is provided. Land-based recreation facilities are also provided at the center, including 11 miles of hiking and biking trails, zipline and high ropes courses, and an artificial rock climbing wall and tower. Visitors can dine at a restaurant overlooking the whitewater course. A 2,400 square foot conference center is available for meetings (USNWC 2008, Maley 2007).

The center is open 7 days a week year round, and fees vary by activity. There is a $5 per vehicle parking fee, but use of the paths around the whitewater runs and the hiking and biking trails is free of charge. Whitewater rafting fees vary by season and day of the week and are in the range of $39-65 per person during the May 1 to September 30 peak season. Rates are discounted on weekdays and during the October through April off-season. Kayakers and canoers may purchase a $20 day pass, with 10-day and monthly passes also available. A variety of boating, climbing, and bicycling gear is available for rent (USNWC 2008).

The USNWC was built as a public/private/nonprofit partnership and is operated by a nonprofit organization. The center is managed by an Executive Director and staff, with the oversight of the USNWC Board of Directors. Local government entities have agreed to pay USNWC an annual service fee of up to $1.7 million for a 7-year period, with payments reduced if annual revenues exceed expenses (Mecklenburg County 2008). It is estimated that 30 percent of the center's revenue will come from businesses using the center for morale and teambuilding efforts. Roughly 70 percent of the center's revenue is expected to come from the summer months (mid-May to Mid-September) (Maley 2007). Additional information on financial characteristics such as revenues, operating expenses, and profit drawn from a 2007 USNWC Financial Statement is provided in Appendix E.

4.4.2.3 Adventure Sports Center International

The Adventure Sports Center International (ASCI) is an artificial channel commercial whitewater park in McHenry, Maryland, that opened in May 2007. It is the world's only mountaintop whitewater facility and includes a recirculating 1,700-foot long course with 550 cfs of flow and a conveyor linking the ponds at the start and end of the course (ASCI 2007, Ruggiero 2007). Six variable wave shapers allow the operators to adjust the rapids from Class II to Class IV, allowing boaters of any skill level to use the course. The course is typically operated at a Class II-III setting for half of the day, and at a Class

III-IV setting for half of the day (ASCI 2007). Guided rafting, private kayaking and canoeing, and the new activity of riverboarding are available (Ripboard Inc. 2008b, ASCI 2007). Inflatable kayaks ("duckies") are available for rent to boaters with prior kayaking experience. Paddling instruction in both hard and inflatable kayaks is also available.

The course can accommodate approximately 200 rafters and dozens of private boaters simultaneously (ASCI 2007), and it is estimated that the center will serve 177,000 people annually (State of Maryland 2006). Although located in a rural area, ASCI is only a 2-hour drive from Pittsburg, Pennsylvania, and 3 hours from the Washington, DC, area. The center hosted several events during its first year of operation, including the 2007 National Whitewater Championships and Freestyle Kayak National Championships (ASCI 2007).

ASCI operates 7 days a week during the spring, summer, and fall seasons. Fees vary by activity, season, day of the week, and age of the participant. Guided rafting during summer weekends is $75 per adult, while a 6-person raft can be reserved for $425. The daily fee for private boaters is $15-20 for one half-day session or $25 for all day. Inflatable kayaks can be rented for $40 for 2 hours. Weekly and season passes are available for private boaters for $100 and $400, respectively, and season passes are available for guided rafting for $600.

The center includes a large operations, retail, and meeting center building (State of Maryland 2006) and a 600-person outdoor amphitheater (Ruggiero 2007). Paths along the whitewater course provide ample opportunity for spectators to observe paddlers on the course. Non-boating activities are available at the center's 550-acre Forked Run Recreation Area, which provides hiking and biking trails, rock climbing, rappelling, and global positioning system (GPS)/orienteering opportunities (ASCI 2007). At the base of the mountain lies the 3,900-acre Deep Creek Lake, a reservoir owned and operated by the State of Maryland that provides flat-water boating, fishing, and other water-based recreation opportunities. A fully developed state park and private commercial establishments on the lake offer a variety of recreation amenities.

ASCI is operated by a nonprofit group with a volunteer board of directors. The nonprofit was formed to develop the center, which was built through a multi-year collaboration between ASCI, the State of Maryland and local governments, a local college, and the site's landowner and real estate developer. The total project investment was $24 million (ASCI 2007). The real estate developer donated more than 550 acres of property for the whitewater course and other recreational uses, and has pledged an annual cash contribution for 10 years (MDNR 2006).

4.4.2.4 Mississippi Whitewater Park (Proposed)

The Mississippi Whitewater Park is a proposed year-round artificial channel public park in Minneapolis, Minnesota, that would divert water from the Mississippi River to a new

channel (MDNR 1999; Mississippi Whitewater Park Development Corp. 2004). The originally proposed course would be 2,000 feet long with a 25-foot drop and could provide a range of difficulty levels; more recent information describes longer and *shorter alternatives.* Users would include whitewater kayakers, canoeists, and rafters (Mississippi Whitewater Park Development Corp. 2004). If built, the park is estimated to receive 50,000 paying visitors per year and 5 to10 times that number of spectators and other users. The park could host international events such as the Olympics, as well as national events such as university competitions (Mississippi Whitewater Park Development Corp. 2004).

The originally estimated construction cost was $15 million (with $7 million in capital costs) (Mississippi Whitewater Park Development Corp. 2003b), but a more recent estimate for total project cost is $26 million. Under a cost-share agreement, two-thirds of the funding would come from federal sources and one-third from state sources (MDNR 2006). An estimated annual economic impact of $2 to $2.5 million has been projected (including visitor spending and user fees), with approximately 30 percent of the estimated spending expected to derive from out-of-state visitors. Visitor fees are expected to cover the operating expenses of the park (Mississippi Whitewater Park Development Corp. 2003b). The University of Minnesota owns the majority of property proposed for the project; other property owners include a utility and the City of Minneapolis.

The project has been delayed by concerns raised by the State of Minnesota Department of Natural Resources (MDNR) regarding placing fill into the river, and by other site use issues. The park is currently undergoing a project redesign and cost analysis. MDNR funded the original park feasibility study (Mississippi Whitewater Park Development Corp. 2003a) and is working with project partners on the redesign, while exploring other options for potential park owners and managers (MDNR 2006).

4.4.2.5 Trinity River Whitewater Course (Proposed)

An artificial channel whitewater park has been proposed for the Trinity River in Dallas, Texas, as one element of the Trinity River Corridor Project, a multi-faceted floodway improvement project addressing 20 miles of the river. The artificial channel park is proposed for an area alongside the river, where water from natural and man-made lakes would be diverted to the river. The proposed park would include intermediate, competition, and play channels, each to serve different types of uses and paddlers. The competition channel and associated proposed facilities would accommodate Olympic and World Cup competitions. The estimated cost of the artificial channel park is $20.2 million (City of Dallas 2006). An instream standing wave structure was also proposed for the Trinity River a few miles downstream of the proposed whitewater course, at Moore Park. The instream wave structure could include a kayak and canoe launch, spectator and vending areas, trails, and parking. The estimated cost for construction is about $1 million (City of Dallas 2008b).

Subsequent to the development of the conceptual plan for the artificial channel park in 2005 (Recreation Engineering and Planning 2005), the proposal was moved to an "ultimate future phase" of the project, with indefinite funding and timing for implementation. Recent Trinity River Corridor Project updates appear to put aside the proposal for the whitewater course, with a pavilion currently planned for the whitewater park site. However, the plans still include the standing wave structure (now expanded from one to two structures), to be built during 2009 using city bond funds. The plans also allow for a lake outlet channel at the original whitewater park site, designed to function as a whitewater course, but its implementation will depend on private funding (City of Dallas 2008a, 2008b).

4.4.3 Summary of Whitewater Boating Parks

In general, the artificial channel parks are more expensive and provide more non-boating facilities than instream channel parks. The artificial channel parks also offer a wider range of boating difficulty, as several of the artificial courses are able to alter the difficulty of the course or provide multiple channels with varying degrees of difficulty. The instream parks are all public parks, most of which are free to use, whereas the artificial channel parks are typically commercial operations that charge user fees for boating activities. Although both types of parks hold events, more of the artificial channel parks host large scale events such as the Olympics. Overall, instream parks are smaller-scale developments than the larger scale, expensive artificial channel parks, which typically provide a range of boating opportunities, more facilities (for boating and other activities), and are physically larger because of more extensive facilities and development.

5.0 SUMMARY AND CONCLUSIONS

5.1 SUPPLY OF WHITEWATER BOATING OPPORTUNITIES

While only one whitewater park exists in the region, in Reno, Nevada, many whitewater runs are available in the Northern California and Northern Nevada region, particularly in the Northern Sierra. Within the Northern Sierra sub-region, more than 30 runs are available on the Feather and Yuba Rivers and their tributaries. Many of these runs are located in Butte County or adjacent Plumas and Yuba Counties, or counties immediately to the south, closer to the Sacramento metropolitan area, putting them within a 2-hour drive of Oroville. However, many of these runs are difficult, and most are only available for use during the spring.

Many additional runs are available at somewhat greater distances from the Oroville area, in the Cascade Range (particularly on the Trinity River and tributaries) north of Oroville, and in the Coast Range (particularly on the Eel and Russian Rivers and tributaries), to the west and southwest of Oroville. Compared to the Northern Sierra, more of these runs are within the easier difficulty classes, and more of the runs are available during the winter as well as during the spring, but few are available during summer or fall. Relatively few runs are available in the Central Sierra sub-region within a 3-hour drive of Oroville.

Overall, the assessment of the current supply of whitewater boating opportunities in the Northern California and Northern Nevada region suggests that a potential whitewater facility (park or non-park) could benefit the whitewater boating community by enhancing the supply of low to moderate difficulty runs (I-II to III-IV) available and the supply of runs of all difficulty classes available during the summer and fall.

5.2 DEMAND FOR WHITEWATER BOATING

Evaluation of whitewater boating demand in the Project area and region is faced with three challenges: (1) the sparseness of available demand data that relate specifically to the Project area and region, (2) the sparseness of available demand data that relate specifically to whitewater boating (vs. general non-motorized types of boating), and (3) inconsistency in the categorization of types of non-motorized boating across national, multi-state regional, and California sources.

Despite these data limitations, the available data support several conclusions that are relevant to the objectives of this study:

1) Demand for whitewater boating is driven mainly by a relatively small but devoted population of enthusiasts, who are motivated to boat often and are highly interested in new and enhanced whitewater boating opportunities.

2) Because of the data limitations, it is difficult to identify a consistent trend in the demand for whitewater boating in the Project area or region, but a consistent, although variable and typically modest, level of demand has existed for at least a decade and appears likely to exist in the future. Some sources indicate an upward trend in participation in non-motorized boating in California during the past decade, but other sources show a decline in rafting and canoeing, and generally flat participation in whitewater kayaking. (The development and adoption by outdoor recreation enthusiasts of new types of whitewater boats and boating activities, as demonstrated by the development of the inexpensive plastic kayak and further development of specialized types of whitewater kayaks, has been and will continue to be an important factor in demand for whitewater boating opportunities.)

3) A core group of whitewater boating enthusiasts is present in the Project area and region, as demonstrated by the use of the recently enhanced runs on the North Fork Feather River in Butte and Plumas Counties (Rock Creek-Cresta Project). Another indication of the presence of this core group is the recent history of boater-driven efforts to expand this and other whitewater boating opportunities on creeks and rivers in the region, typically through the FERC hydropower project relicensing process.

4) Existing whitewater boating demand in the Project area and region could be maximized (and, potentially, new whitewater boating demand could be created, i.e., “induced”) by a whitewater park facility that supports a range of boating activities (particularly rafting, as well as kayaking and closed-deck canoeing) and is appropriate for use by beginners and first-time boaters, as well as those with more experience.

5.3 EXISTING AND PROPOSED WHITEWATER FACILITIES

A range of whitewater park facilities exists in the United States, with each facility to some degree unique in its particular setting, design, and individual boating features, although certain features are common to most instream and artificial channel parks. The smallest existing and proposed parks consist of only one or two instream structures, often enhanced with improved river access and parking, and riverbank improvements. The newest artificial channel parks are large in size and boast numerous special design features (with attendant high construction costs). The channels are generally designed in a loop or double-loop configuration, with water recirculated from the bottom to the top of the course. Non-boating amenities are also important aspects of both instream and artificial channel courses, including ample opportunities for spectators to observe the action on the course, as well as non-boating amenities like trails and climbing walls, food service, and reservable meeting spaces.

Both instream and artificial channel state-of-the-art courses include the following features:

- Individual channels or a portion or portions of the course designed for competitions; these may include slalom gates for specific types of competitions.
- River or channel-side seating and viewing areas for everyday and competition spectators.
- Integration of the course with other non-boating amenities, such as hiking and biking trails or river walks, rock climbing facilities, wildlife/fishery observation, and other forms of adventure sport.

State-of-the-art artificial channel courses also include the following features:

- Two or three channels with different levels of difficulty and purpose to attract both novice and more experienced boaters, and boaters who are focused on training or competition and those who are not.
- Movable flow-directing and wave-shaping barriers, allowing the difficulty of the course to be altered for different user types and competitions, as well as to allow the course to be varied from season to season to maintain boater interest.
- Mechanical conveyors to carry boaters in their boats from the end of the course back to the start of the course, removing the necessity for boaters to get out of their boats between runs and allowing multiple runs in a short period of time.

Anecdotal data suggest that at least some whitewater boaters who have pursued their sport on natural runs, including the most experienced and skilled of paddlers, could be drawn to the predictable conditions, amenities, and convenience of a whitewater park. The following quote from an Olympic-level competitor who uses the Fort Worth, Texas, course illustrates this potential: “Everybody’s first preference would be to have a beautiful, natural whitewater river running through the middle of their town. But where that does not exist, this is the next best thing” (Jones 2004). Similarly, whitewater park designer and former Olympic athlete Scott Shipley has stated that he now prefers the proximity and amenities found in whitewater parks, explaining “the biggest difference by far [between rivers and whitewater parks] isn’t so much experience – it’s the convenience” (Austin 2005).

The design and use patterns of existing parks (and the designs and projected use of proposed parks) suggest that attendance at a potential whitewater park in the Project area or region could be maximized by a facility that:

- Provides good opportunities for spectators to observe whitewater boating;
- Could host paddling events; and
- Provides whitewater boating participation or observation, integrated with other non-boating oriented recreation opportunities nearby, particularly walking and biking trails.

Most of the whitewater parks evaluated host paddling competitions and related events at least annually. These events appear to have the potential to greatly increase the exposure of a park to the general public (and potential paddlers) and to greatly enhance the economic benefits the community may receive from the park.

The cost to design and build the whitewater parks evaluated is as variable as the parks themselves. The least expensive park ($150,000) was created as an add-on to a dam repair project, suggesting that projects that are not driven by whitewater boating objectives but can meet those objectives at reasonable cost have good potential, particularly if funding for park design and construction is limited. The most expensive parks were planned and constructed through the collaboration, generally over several years, of numerous local, state, federal, and government and nonprofit agencies. Both the least and the most expensive parks have been built with funds provided by numerous public and private sources. These facts highlight the necessity for long-term collaboration that characterizes most of the existing parks, which applies to the proposed parks as well.

Fees for use of the artificial channel whitewater parks evaluated vary (the public instream parks evaluated do not charge fees for paddlers' use). In general, user fees do not appear to be sufficient to cover the cost of operating the whitewater parks, or the cost of repayment on the debts accrued to design and build the parks. However, additional information is needed on the financial performance of parks. When evaluating the available data, the recent nature of the two largest parks should be considered; each has completed only a single full operating season or year of operation. Financial performance of the parks may change as the parks mature.

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APPENDIX A

ADDITIONAL INFORMATION ON THE SUPPLY OF WHITEWATER BOATING OPPORTUNITIES

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Table A-1. Northern California whitewater runs.

	Location	Name of Run	Run Class Range	Run Class Optimum	Season	Length (miles)	County	Source
	I. Northern Sierra Sub-Region							
1	**Lower Sacramento and Minor Tributaries (below Shasta Lake)**							
	Antelope Creek	Antelope Creek -- east of Red Bluff	III-IV	III-IV	Spring	21.7	Tehama	(A)
	Battle Creek	Battle Creek -- near Red Bluff	III-IV	III-IV	Spring	11.5	Shasta/Tehama	(A)
	South Fork Battle Creek	Battle Creek, S Fk	V	V	Spring	17.8	Tehama	(D)
	Butte Creek	Butte Creek -- Centerville to Honey Run Bridge	II	II	Spring	5.6	Butte	(C)
	Butte Creek	Butte Creek -- DeSabla PH to Centerville	IV-V	V	Winter/Spring	6.5	Butte	(A)
	Deer Creek	Deer Creek -- Lower	IV-V	IV	Spring	26.0	Tehama	(B)
	Deer Creek	Deer Creek -- Upper	V	V	Spring	16.2	Tehama	(A)
	Mill Creek	Mill Creek -- Lower	V	V	Spring	27.9	Tehama	(A), (C)
	Mill Creek	Mill Creek -- Upper	V	V	Spring	16.9	Tehama	(A), (B), (C)
	Lower Sacramento River	Sacramento River, Lower -- Redding to Red Bluff	I-II	II	Year-round	53.4	Shasta/Tehama	(A)
2	**Feather River and Tributaries**							
	Middle Fork Feather River	Feather River, M Fk -- Bald Rock Canyon	V	V	Spring	6.7	Butte	(C)
	Middle Fork Feather River	Feather River, M Fk -- Devils Canyon	V	V	Spring	32.9	Plumas/Butte	(C), (A)
	Middle Fork Feather River	Feather River, M Fk -- Sloat	II-III	III	Spring	7.6	Plumas	(A)
	Middle Feather River, Little North Fork	Feather River, M Fk, Little N Fk	V-VI	V-VI	Winter/Spring	9.2	Plumas/Butte	(C)

Table A-1. Northern California whitewater runs.

	Location	Name of Run	Run Class		Season	Length (miles)	County	Source
			Range	Optimum				
	North Fork Feather River	Feather River, N Fk – Cresta (see note at bottom of table)	III-IV	III-IV	Spring/Summer/ Fall (summer/fall dam releases)	6.5	Plumas/Butte	(C)
	North Fork Feather River	Feather River, N Fk – Poe (see note at bottom of table	IV-V	IV-V	Spring/Summer/ Fall	7.6	Butte	(C), (A)
	North Fork Feather River	Feather River, N Fk -- Rock Creek (see note at bottom of table)	III-IV	III-IV	Spring/Summer/ Fall (summer/fall dam releases)	9.0	Plumas	(C)
	East Br North Fk Feather River	Feather River, N Fk, E Br -- Virgilia to Belden	IV	IV	Spring	9.0	Plumas	(C)
	South Fork Feather River	Feather River, S Fk -- below Little Grass Valley Res.	IV-V	IV-V	Fall	9.2	Plumas	(E), (D)
	South Fork Feather River	Feather River, S Fk -- Forbestown Dam to Ponderosa Res	V	V	Winter/Spring	5.1	Butte	(E), (D)
	South Fork Feather River	Feather River, S Fk -- Golden Trout to Forbestown Dam	V	V	Fall	6.7	Butte	(D)
	West Branch Feather River	Feather River, West Branch -- Ben & Jerry's Gorge	V	V	Winter/Spring	7.0	Butte	(C)
	West Branch Feather River	Feather River, West Branch -- Upper	IV-V	IV-V	Winter/Spring	3.3	Butte	(C)
	Indian Creek (E.B.N.F. tributary)	Indian Creek -- Crescent Mills to Spanish Creek	IV-V	IV-V	Winter/Spring	5.8	Plumas	(C), (A)
3	**Yuba River and Tributaries**							
	Fordyce Creek (S.F. Yuba tributary)	Fordyce Creek (Yuba River, S Fk tributary)	IV-V	IV-V	Summer	9.9	Nevada	(A), (C), (B)
	Lavezzola Creek (N.F. Yuba tributary)	Lavezzola Creek/Downie River (Yuba River, N Fk trib)	IV	IV	Winter/Spring	4.0	Sierra	(C)
	Pauley Creek (N.F. Yuba tributary)	Pauley Creek (Yuba River, N Fk tributary)	IV-V	IV-V	Winter/Spring	3.6	Sierra	(C), (A)

Table A-1. Northern California whitewater runs.

	Location	Name of Run	Run Class		Season	Length (miles)	County	Source
			Range	Optimum				
	Yuba River (Main Stem)	Yuba River -- Englebright Dam to Hwy 20	II-III	II	Summer/Fall	5.8	Yuba/Nevada	(C), (A)
	Middle Fork Yuba River	Yuba River, M Fk -- Hwy 49 to Englebright Res.	IV-V	IV-V	Spring	10.4	Yuba/Nevada	(C), (A)
	Middle Fork Yuba River	Yuba River, M Fk -- Plumbago to Hwy 49	III-V	III-IV	Spring	21.7	Yuba/Nevada/Sierra	(C)
	North Fork Yuba River	Yuba River, N Fk -- Bullards Bar Dam to Yuba River, M Fk	V	V	Spring	2.3	Yuba	(C)
	North Fork Yuba River	Yuba River, N Fk -- Goodyears Bar to Hwy 49	IV	IV	Spring	8.8	Sierra	(C), (A)
	North Fork Yuba River	Yuba River, N Fk -- Loves Falls	V	V	Winter/Spring	2.8	Sierra	(C)
	North Fork Yuba River	Yuba River, N Fk -- Rosassco Canyon	IV-V	IV-V	Spring	4.0	Sierra	(C)
	North Fork Yuba River	Yuba River, N Fk -- Sierra City to Downieville	IV-V	IV-V	Spring	13.8	Sierra	(C)
	South Fork Yuba River	Yuba River, S Fk -- Edwards to Purdon's Crossing	III-IV	III-IV	Spring	4.1	Nevada	(C), (A), (D)
	South Fork Yuba River	Yuba River, S Fk -- Hwy 49 to Bridgeport	IV-V	IV-V	Spring	7.1	Nevada	(C), (A)
	South Fork Yuba River	Yuba River, S Fk -- Indian Springs CG to Lk Spaulding	IV-V	IV-V	Spring	3.4	Nevada	(C), (D)
	South Fork Yuba River	Yuba River, S Fk -- Kingvale to Indian Springs CG	IV	IV	Spring	8.7	Nevada/Placer	(C)
	South Fork Yuba River	Yuba River, S Fk -- Purdon's Crossing to Hwy 49	V	V	Spring	4.0	Nevada	(C), (D)
	South Fork Yuba River	Yuba River, S Fk -- Washington to Edwards	IV	IV	Winter/Spring	13.5	Nevada	(C), (D)
4	**Bear River**							
	Bear River	Bear River -- Hwy 174 to Taylor Crossing	III-IV	III-IV	Spring/Fall	2.7	Nevada/Placer	(A), (C)
	Bear River	Bear River --Taylor Crossing to Combie Res.	II	II	Spring	9.1	Nevada/Placer	(B), (A), (C)
5	**Truckee River**							
	Truckee River	Truckee River -- Boca to Floriston	II-III	III	Spr/Summer	7.0	Nevada	(D), (A), (C)
	Truckee River	Truckee River -- Floriston to Verdi, NV	II-III	III	Spr/Summer	6.4	Nevada/Sierra/ Washoe	(C), (A)

Table A-1. Northern California whitewater runs.

	Location	Name of Run	Run Class		Season	Length (miles)	County	Source
			Range	Optimum				
	Truckee River	Truckee River -- River Ranch	III	III	Spr/Summer	11.6	Placer/Nevada	(C)
	Truckee River	Truckee River -- Truckee to Boca	II-III	III	Spr/Summer	9.5	Nevada	(D), (B)
6	**American River and Tributaries**							
	American River	American River -- Main Stem	I-II	II	Year-round	21.7	Sacramento	(A)
	Middle Fork Am. River	American River, M Fk -- below Mammoth Bar	II-III	III	Summer	2.0	Placer/El Dorado	(A)
	Middle Fork Am. River	American River, M Fk -- Greenwood Brdg to Mammoth Bar	I-II	II	Summer	7.1	Placer/El Dorado	(B)
	North Fork of Middle Fork Am. River	American River, M Fk -- North Fork	V	V	Winter/Spring	12.7	Placer	(C)
	Middle Fork Am. River	American River, M Fk -- Tunnel	IV	IV	Spr/Summer	15.3	Placer/El Dorado	(A), (C)
	North Fork Am. River	American River, N Fk -- Chamberlain Falls	III-IV	III-IV	Winter/Spring	4.8	Placer	(A), (C)
	North Fork Am. River	American River, N Fk -- Generation Gap	IV-V	IV-V	Spring	12.7	Placer	(C), (D)
	North Fork Am. River	American River, N Fk -- Giant Gap	IV-V	IV-V	Winter/Spring	14.3	Placer	(B), (A), (C)
	North Fork Am. River	American River, N Fk -- near Auburn (below Ponderosa)	II	II	Spring	4.1	Placer	(A)
	North Fork Am. River	American River, N Fk -- Ponderosa Way	II-III	III	Spring	4.6	Placer	(C)
	South Fork Am. River	American River, S Fk -- Chili Bar	III-IV	III-IV	Year-round	7.4	El Dorado	(C)
	South Fork Am. River	American River, S Fk -- Coloma to Lotus CG	II-III	II	Spr/Summer	3.3	El Dorado	(C)
	South Fork Am. River	American River, S Fk -- Golden Gate	V	V	Spring	9.3	El Dorado	(C)
	South Fork Am. River	American River, S Fk -- Gorge	III-IV	III-IV	Year-round	8.5	El Dorado	(C)
	South Fork Am. River	American River, S Fk -- Kyburz to Riverton	III-V	III-IV	Spring	9.5	El Dorado	(B), (A), (C), (D)
	South Fork Am. River	American River, S Fk -- Lovers Leap	V	V	Spring	9.5	El Dorado	(C)

Table A-1. Northern California whitewater runs.

	Location	Name of Run	Run Class Range	Run Class Optimum	Season	Length (miles)	County	Source
	South Fork Am. River	American River, S Fk -- Riverton to Peavine	III-IV	III-IV	Spring	3.5	El Dorado	(C)
	South Fork Am. River	American River, S Fk -- Slab Creek	V	V	Spring	8.1	El Dorado	(C)
	Silver Fork Am. River	American River, Silver Fk -- Dugald Bremner	V	V	Spring/Summer	3.0	El Dorado	(C)
	Silver Fork Am. River	American River, Silver Fk -- Lower	V	V	Spring/Summer	3.3	El Dorado	(C)
	Rock Creek (S.F. American tributary)	Rock Creek (American River, S Fk tributary)	IV	IV	Winter/Spring	9.4	El Dorado	(C)
	Rubicon River (M.F. tributary)	Rubicon River -- Lower (American River, M Fk trib)	V	V	Spring	20.8	Placer/El Dorado	(C), (A)
	Silver Creek (S.F. tributary)	Silver Creek (American River, S FK tributary)	V	V	Spring	6.2	El Dorado	(C)
	II. Cascades/Coast Range Sub-Region							
1	**Upper Sacramento River and McCloud River (above Shasta Lake)**							
	McCloud River	McCloud River -- Hearst	II-IV	III	Spring/Summer	10.6	Siskiyou/Shasta	(C), (A)
	McCloud River	McCloud River -- Lower	III-IV	IV	Year-round	24.4	Shasta	(B), (A), (C)
	Upper Sac. River	Sacramento River, S Fk	V	V	Winter/Spring	7.4	Siskiyou	(C)
	Upper Sac. River	Sacramento River, Upper -- Box Canyon	IV	IV	Spring	7.6	Siskiyou	(C), (A), (D)
	Upper Sac. River	Sacramento River, Upper -- Castle Crags to Sims Rd	III-IV	III	Spring	7.8	Shasta	(C), (D)
	Upper Sac. River	Sacramento River, Upper -- Dunsmuir to Castle Crags	III-IV	III	Spring	7.0	Siskiyou/Shasta	(C), (D)
	Upper Sac. River	Sacramento River, Upper -- Sims Flat to Shasta Lake	III-IV	III	Spring	14.2	Shasta	(C), (D)
	Slate Creek (Upper Sac tributary)	Slate Creek (Upper Sacramento tributary)	V	V	Winter/Spring	4.6	Shasta	(C)

Table A-1. Northern California whitewater runs.

	Location	Name of Run	Run Class		Season	Length (miles)	County	Source
			Range	Optimum				
2	**Salmon River (Klamath River tributary)**							
	South Fork Salmon River	Salmon River -- South Fork	IV-V	IV-V	Winter/Spring	6.0	Siskiyou	(C)
	North Fork Salmon River	Salmon River, N Fk -- Lower	III-V	IV-V	Winter/Spring	11.3	Siskiyou	(A)
	North Fork Salmon River	Salmon River, N Fk -- Upper	III-IV	III-IV	Winter/Spring	9.0	Siskiyou	(C)
3	**Trinity River and Tributaries**							
	Canyon Creek (Trinity River tributary)	Canyon Creek (Trinity River tributary)	III-IV	III-IV	Winter/Spring	9.4	Trinity	(C)
	Coffee Creek (Trinity River tributary)	Coffee Creek -- above Claire Engle Res.	III-IV	III-IV	Spring	13.2	Trinity	(A)
	Hayfork Creek (S.F. Trinity tributary)	Hayfork Creek -- Lower Gorge	IV-V	IV-V	Winter/Spring	14.9	Trinity	(C)
	Hayfork Creek (S.F. Trinity tributary)	Hayfork Creek -- Upper Gorge	III-V	III-IV	Winter/Spring	6.3	Trinity	(C)
	New River (Trinity River tributary)	New River -- Denny	III-IV	III-IV	Winter/Spring	4.5	Trinity	(C)
	New River (Trinity River tributary)	New River -- Gorge	IV-V	IV-V	Winter/Spring	7.5	Trinity	(C)
	New River (Trinity River tributary)	New River -- Upper	III-V	IV-V	Winter/Spring	4.3	Trinity	(C)
	Trinity River	Trinity River -- above Claire Engle Res.	III-IV	III-IV	Spring	10.3	Trinity	(A)
	Trinity River	Trinity River -- Big Flat to Hayden Flat	II	II	Year-round	8.7	Trinity	(A)
	Trinity River	Trinity River -- Burnt Ranch Gorge	V	V	Spring/Summer	8.7	Trinity	(A), (B), (C)
	Trinity River	Trinity River -- Douglas City to Junction	I-II	II	Year-round	14.8	Trinity	(A)
	Trinity River	Trinity River -- Hayden Flat to China Slide	II-III	II	Year-round	10.2	Trinity	(A)
	Trinity River	Trinity River -- Lower	II	II	Year-round	8.7	Trinity/Humboldt	(A)

Table A-1. Northern California whitewater runs.

	Location	Name of Run	Run Class		Season	Length (miles)	County	Source
			Range	Optimum				
	Trinity River	Trinity River -- Pigeon Pt to Big Flat	II-IV	III	Year-round	5.3	Trinity	(C)
	East Fork Trinity River	Trinity River, E Fk	IV-V	IV-V	Winter/Spring	9.9	Trinity	(C), (D)
	North Fork Trinity River	Trinity River, N Fk	IV-V	IV-V	Spring	14.0	Trinity	(C)
	South Fork Trinity River	Trinity River, S Fk -- Klondike Mine	IV-V	IV-V	Winter/Spring	4.6	Trinity	(C)
	South Fork Trinity River	Trinity River, S Fk -- Klondike to Oak Flat	II-III	III	Spring	17.0	Trinity	(B)
	South Fork Trinity River	Trinity River, S Fk -- Lower	III-V	IV-V	Winter/Spring	17.1	Trinity/Humboldt	(C)
	Willow Creek (S.F. Trinity tributary)	Willow Creek (Trinity River tributary)	V	V	Winter/Spring	5.2	Humboldt	(C)
4	**Clear Creek and Brandy Creek (Whiskeytown Area)**							
	Brandy Creek	Brandy Creek -- above Whiskeytown Res.	V	V	Winter/Spring	2.5	Shasta	(A)
	Clear Creek	Clear Creek -- below Whiskeytown Res.	IV	IV	Fall/Winter	9.0	Shasta	(C), (A)
5	**Eel River and Tributaries**							
	Black Butte River (M.F. Eel tributary)	Black Butte River -- near Covelo	IV	IV	Spring	24.0	Mendocino/Glenn	(A)
	Eel River	Eel River -- below Pillsbury Res.	II-V	III-IV	Year-round	5.9	Lake	(B), (C), (A), (D)
	Eel River	Eel River -- Dos Rios to Alderpoint	II-IV	III	Winter/Spring	45.5	Mendocino/Trinity/ Humboldt	(B), (C)
	Eel River	Eel River -- Outlet Creek to Dos Rios	III	III	Winter/Spring	6.8	Mendocino	(A)
	Eel River	Eel River -- Upper Main	IV-V	IV-V	Winter/Spring	14.7	Lake	(C)
	Middle Fork Eel River	Eel River, M Fk -- Black Butte R to Dos Rios	II-V	IV-V	Winter/Spring	31.8	Mendocino	(C)
	North Fork Eel River	Eel River, N Fk -- Hull Creek to Mina Rd	III	III	Winter/Spring	8.7	Trinity/Mendocino	(B)
	North Fork Eel River	Eel River, N Fk -- Salt Creek to Hull Creek	III-IV	III-IV	Winter/Spring	12.3	Trinity	(A)
	Eel River	Eel River, Rice Fork - above Pillsbury	II	II	Spring	8.9	Lake	(A)

Table A-1. Northern California whitewater runs.

	Location	Name of Run	Run Class		Season	Length (miles)	County	Source
			Range	Optimum				
	South Fork Eel River	Eel River, S Fk -- Big Bend to Redwood Flat	II	II	Winter/Spring	10.7	Mendocino	(A)
	South Fork Eel River	Eel River, S Fk/Ten Mile Creek -- US101 to Big Bend	III-IV	III-IV	Winter/Spring	16.0	Mendocino	(C)
	Rattlesnake Creek (S.F. Eel tributary)	Rattlesnake Creek (Eel River, S Fk tributary)	IV-V	IV-V	Winter	5.0	Mendocino	(C)
	Tomki Creek / Eel River	Tomki Creek / Eel River	III	III	Winter	17.3	Mendocino	(C)
6	**Cache Creek**							
	Bear Creek (Cache Creek tributary)	Bear Creek -- above Cache Creek confluence	IV	IV	Winter	7.2	Colusa/Yolo	(A)
	Cache Creek	Cache Creek -- Rowboat Rapid	II-IV	III	Winter/Spring/ Summer	9.6	Colusa/Yolo	(C)
	Cache Creek	Cache Creek -- Rumsey to Esparto	II	II	Spring/Summer	16.8	Yolo	(A), (B)
	Cache Creek	Cache Creek -- Wilderness	II	II	Summer	18.7	Lake/Yolo/Colusa	(B)
7	**Russian River and Tributaries**							
	Big Sulphur Creek (trib)	Big Sulphur Creek -- Lower	IV-V	IV-V	Winter/Spring	9.2	Sonoma	(A), (C)
	Big Sulphur Creek (trib)	Big Sulphur Creek -- Upper	III-V	IV-V	Winter/Spring	4.9	Sonoma	(A), (C)
	Russian River	Russian River -- Alexander Valley to Healdsburg	I-II	II	Winter/Spring/ Summer	14.6	Sonoma	(A)
	Russian River	Russian River -- Asti to Alexander Valley Rd	I-II	II	Winter/Spring	12.1	Sonoma	(A)
	Russian River	Russian River -- Preston to Asti	I	I	Year-round	6.1	Sonoma	(A)
	Russian River	Russian River -- Squaw Rock Run	II-III	III	Year-round	8.2	Mendocino/Sonoma	(C), (A)
	Russian River, E Fk	Russian River, E Fk -- Potter Valley	II	II	Year-round	2.8	Mendocino	(A)
8	**Other Small Coast Range Creeks**							
	Grindstone Creek	Grindstone Creek -- above Black Butte Res.	III-IV	III-IV	Winter	12.0	Glenn	(C), (A)

Table A-1. Northern California whitewater runs.

	Location	Name of Run	Run Class Range	Run Class Optimum	Season	Length (miles)	County	Source
	Putah Creek	Putah Creek -- below Berryessa Res.	II	II	Summer	4.8	Solano/Yolo	(A)
	Putah Creek	Putah Creek -- Hwy 29 to Bessyessa	IV-V	IV	Winter	18.1	Napa/Lake	(C)
	Stony Creek	Stony Creek -- Dam to Grindstone Creek	I-II	II	Winter/Spring	6.8	Glenn	(A)
	Stony Creek	Stony Creek -- Fouts Springs Rd to Diversion Dam	IV	IV	Winter/Spring	4.8	Colusa	(C)
	Stony Creek	Stony Creek -- Stonyford to Rd 303	II	II	Winter/Spring	5.3	Glenn/Colusa	(A)
	III. Central Sierra Sub-Region							
1	**Cosumnes River**							
	Cosumnes River	Cosumnes River -- Lower	III-IV	III-IV	Winter/Spring	9.9	El Dorado/Amador/ Sacramento	(A), (C)
	Cosumnes River	Cosumnes River -- Upper	IV	IV	Winter/Spring	10.5	El Dorado/Amador	(A), (C), (B)
	Middle Fork Cosumnes River	Cosumnes River, M Fk	IV	IV	Winter/Spring	12.5	El Dorado/Amador	(C)
	North Fork Cosumnes River	Cosumnes River, N Fk -- Lower	V	V	Winter/Spring	7.6	El Dorado	(C)
	North Fork Cosumnes River	Cosumnes River, N Fk -- Upper	IV	IV	Winter/Spring	6.9	El Dorado	(C)
2	**Mokelumne River**							
	Mokelumne River	Mokelumne River -- Electra	II-III	III	Year-round (summer dam releases)	3.1	Amador/Calaveras	(B), (A), (C)
	North Fork Mokelumne River	Mokelumne River, N Fk -- Bear River to Tiger Creek	III-V	IV-V	Spring	12.5	Amador/Calaveras	(C)
	North Fork Mokelumne River	Mokelumne River, N Fk -- Fantasy Falls	V	V	Spring	19.9	Amador/Calaveras/ Alpine	(C)
	North Fork Mokelumne River	Mokelumne River, N Fk -- Tiger Creek Dam to Red Corral Road	III-IV	IV	Spring/Summer (dam releases May-June)	3.1	Amador/Calaveras	(C)

Table A-1. Northern California whitewater runs.

Location	Name of Run	Run Class		Season	Length (miles)	County	Source
		Range	Optimum				

Note: Scheduled summer and fall recreation flow releases began on the Rock Creek and Cresta runs of the North Fork Feather River in 2004, generally occurring on one or two weekend days per month from June through October. Releases are reduced in dry years. Releases on the Cresta run have been cancelled the past several years due to potential effects on frog populations. Studies and discussions regarding revised Cresta releases for future years are ongoing. American Whitewater has proposed a single summer pulse flow that would peak in May but that would provide boatable flows for much of the summer. Although no scheduled releases occur on the Poe run, upstream releases on the Rock Creek and Cresta runs enhance whitewater conditions on the Poe run.

Sources:

(A) California Creek website
(B) Cassady & Calhoun
(C) Holbek and Stanley
(D) American Whitewater website
(E) Dreamflows online guidebook

Source: Compiled by EDAW, Inc. 2008

Analysis of Whitewater Boating Opportunities in the Region

Existing whitewater boating opportunities were organized and reviewed by difficulty class, length of run, and season to identify the relative abundance, or lack thereof, of opportunities in each of these categories. The difficulty classes were categorized as follows: Easy (Class I or II), Moderate (Class III or III-IV), Difficult (Class IV through V-VI) (see Appendix B for a description of each difficulty class). As a run's difficulty can vary depending on flow, in this study, a run's difficulty was defined as the difficulty class at optimum flow conditions, as identified by the sources described in Section 3.2. Run lengths were grouped as follows: short (less than 6 miles), medium (6 to 11 miles), and long (11 miles and above). Run seasons included all or part of winter, spring, summer, and/or fall, with many runs spanning multiple seasons and a few runs available year round.

Difficulty Classes

The number of runs in each difficulty class varies by sub-region. Table A-2 lists and summarizes the runs by difficulty class within the three sub-regions. Figure A-1 provides a map of all identified whitewater runs, color-coded by difficulty class. The proportion of runs in the most difficult classes (Classes IV through VI) range from 41 percent in the Cascades and Coast Range, 60 percent in the Northern Sierra, and 77 percent in the Central Sierra. The proportion of runs in the moderate classes (III and III-IV) are somewhat less variable, ranging from 22 percent in the Central Sierra, 27 percent in the Northern Sierra, and 35 percent in the Cascades and Coast Range. Runs in the easy classes (I and II) range from 11 percent in the Northern Sierra to 24 percent in the Cascades and Coast Range, with none in the Central Sierra for the two rivers included in this sub-region.

Table A-2. Comparison of available runs in each sub-region by difficulty class. [(a)]

Sub-region	Total # of Runs [(b)]	Easy		Moderate				Difficult					
		I-II	*% of Total Runs*	III	*% of Total Runs*	III-IV	*% of Total Runs*	IV	*% of Total Runs*	IV-V	*% of Total Runs*	V-VI	*% of Total Runs*
Northern Sierra	70	8	*11%*	7	*10%*	12	*17%*	8	*11%*	18	*17%*	22	*32%*
Cascades/ Coast Range	63	15	*24%*	12	*19%*	10	*16%*	7	*11%*	14	*22%*	5	*8%*
Central Sierra	9	--	--	1	*11%*	1	*11%*	4	*44%*	1	*11%*	2	*22%*
TOTAL	142	23	*16%*	20	*14%*	23	*16%*	19	*13%*	28	*20%*	29	*20%*

Notes (a) Difficulty class can vary based on flows; therefore, class ratings are based on optimum desired flows.
(b) Runs are described by sources as distinct river segments, but many are continuous along certain rivers.
Sources: Holbek and Stanley 1998, Cassady & Calhoun 1995, Tuthill et al. 2008, American Whitewater 2006, Shackleton 2007, and EA Engineering, Science, and Technology 1993.

Length of Runs

The different run length categories are generally well balanced in all three sub-regions (Table A-3). For all three sub-regions, medium-length runs (6 to10 miles) comprise 41 to 44 percent of the sub-region totals. Roughly one-third (27 to 35 percent) of the runs are long (11 miles+), and roughly one-quarter (22 to 31 percent) of the runs are short (less than 6 miles).

Table A-3. Comparison of available runs in each sub-region by run length. [(a)]

Sub-region	Total # of Runs [(b)]	Short (0-5 miles)		Medium (6-10 miles)		Long (11+ miles)	
		# of Runs	*% of Total Runs*	# of Runs	*% of Total Runs*	# of Runs	*% of Total Runs*
Northern Sierra	70	22	*31%*	29	*41%*	19	*27%*
Cascades/ Coast Range	63	14	*22%*	27	*43%*	22	*35%*
Central Sierra	9	2	*22%*	4	*44%*	3	*33%*
TOTAL	142	38	*27%*	60	*42%*	44	*31%*

Notes: (a) Length classifications were generalized from GIS-calculated lengths.
(b) Runs are described by sources as distinct river segments, but many are continuous along certain rivers.
Sources: Holbek and Stanley 1998, Cassady & Calhoun 1995, Tuthill et al. 2008, American Whitewater 2006, Shackleton 2007, and EA Engineering, Science, and Technology 1993.

Seasonality

Each spring, seasonal snowmelt supplies the peak flows in California's rivers and streams. Therefore, spring whitewater boating opportunities far outnumber opportunities in any other season since. Table A-4 summarizes the seasonal classification of all runs in the study area by sub-region. Figure A-2 provides a map of all identified whitewater runs, color-coded by seasonality.

The vast majority (87 to 91 percent) of runs in all sub-regions are available during the spring. Overall, winter runs comprise slightly more than half of the total spring run availability, although the relative proportion of winter to spring runs varies greatly by sub-region. The greatest proportion of runs available in winter are within the Cascades and Coast Range sub-region (76 percent) and in the Central Sierra sub-region (60 percent). However, in the Northern Sierra sub-region, only 26 percent are available in winter. Overall, summer run opportunities equal only about half of the available winter opportunity supply, and less than one third (between 10 and 27 percent) of the total whitewater run opportunities. For all sub-regions, fall runs are in shortest supply, with only 10 to 17 percent of the runs available in any of the three sub-regions. The reduced supply of fall runs logically corresponds with the naturally diminishing flows associated with the seasonal summer and early fall drought throughout California, when rains are minimal and snowmelt has essentially ceased.

MAP WINDOW

CALIFORNIA

0 100 200 Miles

Oroville Facilities Project Area

LEGEND

Selected Whitewater Runs

Difficulty Class

- I
- II
- III
- III - IV
- IV
- IV - V
- V
- V - VI

Public Lands

- US Forest Service
- National Park Service
- BLM

Source: DWR 2007 / Map prepared by EDAW 2007

0 10 20 40 Miles

Scale 1 : 1,267,200
1" = 20 miles
[Plot at 100% for 11x17]

Whitewater Boating Feasibility Study
Prepared for SBF Steering Committee

FIGURE A-1

Northern California Whitewater Opportunities

Difficulty Classification

Prepared by: PJ -- EDAW, Inc.

Date 12/09

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MAP WINDOW

CALIFORNIA

0 100 200 Miles

LEGEND

Selected Whitewater Runs

Seasonality

- Fall
- Fall / Winter
- Spring
- Spring / Fall
- Spring / Summer
- Spring / Summer / Fall
- Summer
- Summer / Fall
- Winter
- Winter / Spring
- Winter / Spring / Summer
- Year-round

Public Lands

- US Forest Service
- National Park Service
- BLM

Oroville Facilities Project Area

Source: DWR 2007 / Map prepared by EDAW 2007

0 10 20 40 Miles

Scale 1 : 1,267,200
1" = 20 miles
[Plot at 100% for 11x17]

Whitewater Boating Feasibility Study
Prepared for SBF Steering Committee

FIGURE A-2

Northern California Whitewater Opportunities

Seasonality

Prepared by: PJ -- EDAW, Inc.

Date 12/09

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Table A-4. Comparison of available runs in each sub-region by season. [(a)]

Sub-region	Total # of Runs [(b)]	Winter		Spring		Summer		Fall	
		# of Runs	*% of Total Runs*	# of Runs	*% of Total Runs*	# of Runs	*% of Total Runs*	# of Runs	*% of Total Runs*
Northern Sierra	70	18	*26%*	64	*91%*	19	*27%*	11	*16%*
Cascades/ Coast Range	63	48	*76%*	55	*87%*	17	*27%*	11	*17%*
Central Sierra	9	6	*60%*	9	*90%*	1	*10%*	1	*10%*
TOTAL	142	72	*51%*	128	*90%*	37	*26%*	23	*16%*

Notes: (a) May include a portion of a season up to an entire season. When multiple seasons are included, each season is counted. (Thus, total numbers of runs counted by season are greater than actual total number of runs.)
(b) Runs are described by sources as distinct river segments, but many are continuous along certain rivers.
Sources: Holbek and Stanley 1998, Cassady & Calhoun 1995, Tuthill et al. 2008, American Whitewater 2006, Shackleton 2007, and EA Engineering, Science, and Technology 1993.

Difficulty Class by Seasonality

In a further effort to determine the relative abundance and/or shortfall of supply for whitewater boating opportunities within the study area, a comparative breakdown of runs available by season and difficulty class was performed (see Table A-5). Specific analyses by season, overall conclusions, as well as a tabular summary of the analysis follow.

Spring

In total, 128 runs are available in the spring for a total of 1,346 miles. Most runs have a spring component unless excessive water flows render the run too difficult. In general, spring runs seem well distributed over the difficulty classes for the Cascades and Coast Range sub-region. Runs in the Northern Sierra sub-region and the small number of runs in the Central Sierra sub-region tend to be in the difficult classes.

Winter

In total, 72 runs are available in the winter for a total of 747 miles. The Cascades and Coast Range sub-region appears to have the most even distribution of difficulty classes within winter runs and the greatest availability of winter runs overall. For the Northern Sierra sub-region, the relatively few winter runs tend to be in the highest difficulty classes. A similar generalization can be made for the Central Sierra sub-region, where available winter runs are very few.

Summer

In total, 37 runs are available in the summer for a total of 382 miles. In general, summer runs tend toward the easy and moderate difficulty classes throughout the three sub-regions. Summer runs in the difficult classes tend to be in shortest supply, especially in the Cascades and Coast Range and Central Sierra sub-regions.

Fall

In total, 23 runs are available in the fall for a total of 246 miles. Fall runs, especially in the difficult classes, are clearly in shortest supply throughout all regions as the few fall runs tend toward the easy and moderate difficulty classes.

Table A-5. Comparison of available runs in each season by sub-region and difficulty class. [(a) (b)]

Sub-region	Total # of Runs [(c)]	Easy	Moderate		Difficult		
		I-II	III	III-IV	IV	IV-V	V-VI
Spring Season							
Northern Sierra	64	6	6	12	8	11	21
Cascades/ Coast Range	55	13	11	9	4	13	5
Central Sierra	9		1	1	4	1	2
Winter Season							
Northern Sierra	18	2		3	3	4	6
Cascades/ Coast Range	48	11	7	8	5	13	4
Central Sierra	6		1	1	3		1
Summer Season							
Northern Sierra	19	5	5	4	1	2	2
Cascades/ Coast Range	17	10	4	1	1		1
Central Sierra	1		1				
Fall Season							
Northern Sierra	11	3		5		2	1
Cascades/ Coast Range	11	6	2	1	2		
Central Sierra	1		1				

Notes: (a) Difficulty class can vary based on flows; therefore, ratings based on optimum desired flows are given.
(b) May include a portion of a season up to an entire season. When multiple seasons are included, each season is counted.
(c) Runs are described by sources as distinct river segments, but many are continuous along certain rivers.
Sources: Holbek and Stanley 1998, Cassady & Calhoun 1995, Tuthill et al. 2008, American Whitewater 2006, Shackleton 2007, and EA Engineering, Science, and Technology 1993.

Conclusions

Based on the assessment in Section 4.2 and additional details in this appendix, it is clear that whitewater opportunities throughout the study area region (defined as the area whose residents are within an estimated 3-hour drive from Oroville) are generally limited in the summer and even more so in the fall seasons. Significantly fewer runs are available in the summer and fall for all sub-regions, as well as in the winter for the Northern Sierra sub-region. The more detailed assessment in this appendix indicates that the number of runs in higher difficulty classes tend to be in short supply during the summer and fall seasons throughout all sub-regions. Even in the Northern Sierra sub-region, which has the most available runs, the actual numbers of such runs available in the fall are five or less in each difficulty class. Easy to moderate difficulty runs available during the winter in the Northern Sierra sub-region are also under-represented.

APPENDIX B

DEFINITION OF THE SIX WHITEWATER DIFFICULTY CLASSES

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Definition of the Six Whitewater Difficulty Classes

Class I: Easy. Fast-moving water with riffles and small waves. Few obstructions, all obvious and easily missed with little training. Risk to swimmers is slight; self-rescue is easy.

Class II: Novice. Straightforward rapids with wide, clear channels that are evident without scouting. Occasional maneuvering may be required, but rocks and medium sized waves are easily missed by trained paddlers. Swimmers are seldom injured and group assistance, while helpful, is seldom needed. Rapids that are at the upper end of this difficulty range are designated "Class II+."

Class III: Intermediate. Rapids with moderate, irregular waves that may be difficult to avoid and that can swamp an open canoe. Complex maneuvers in fast current and good boat control in tight passages or around ledges are often required; large waves or strainers may be present but are easily avoided. Strong eddies and powerful current effects can be found, particularly on large-volume rivers. Scouting is advisable for inexperienced parties. Injuries while swimming are rare; self-rescue is usually easy, but group assistance may be required to avoid long swims. Rapids that are at the lower or upper end of this difficulty range are designated "Class III-" or "Class III+", respectively.

Class IV: Advanced. Intense, powerful but predictable rapids requiring precise boat handling in turbulent water. Depending on the character of the river, it may feature large, unavoidable waves and holes or constricted passages demanding fast maneuvers under pressure. A fast, reliable eddy turn may be needed to initiate maneuvers, scout rapids, or rest. Rapids may require "must" moves above dangerous hazards. Scouting may be necessary the first time down. Risk of injury to swimmers is moderate to high, and water conditions may make self-rescue difficult. Group assistance for rescue is often essential but requires practiced skills. A strong Eskimo roll is highly recommended. Rapids that are at the lower or upper end of this difficulty range are designated "Class IV-" or "Class IV+", respectively.

Class V: Expert. Extremely long, obstructed, or very violent rapids that expose a paddler to added risk. Drops may contain large unavoidable waves and holes or steep, congested chutes with complex, demanding routes. Rapids may continue for long distances between pools, demanding a high level of fitness. What eddies exist may be small, turbulent, or difficult to reach. At the high end of the scale, several of these factors may be combined. Scouting is recommended but may be difficult. Swims are dangerous, and rescue is often difficult even for experts. A very reliable Eskimo roll, proper equipment, extensive experience, and practiced rescue skills are essential. Because of the large range of difficulty that exists beyond Class IV, Class V is an open ended, multiple level scale designated as Class 5.0, 5.1, 5.2, etc. Each of these levels is an order of magnitude more difficult that the last. Example: Increasing difficulty from

Class 5.0 to Class 5.1 is a similar order of magnitude as increasing from Class IV to Class V.

Class VI: Extreme and Exploratory. These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger. The consequences of errors are severe, and rescue may be impossible. For teams of experts only, at favorable water levels, after close personal inspection and taking all precautions. After a Class VI rapid has been run many times, its rating may be changed to an appropriate Class 5.X rating.

APPENDIX C

IMAGES AND SITE PLANS OF EXISTING & PROPOSED WHITEWATER PARKS

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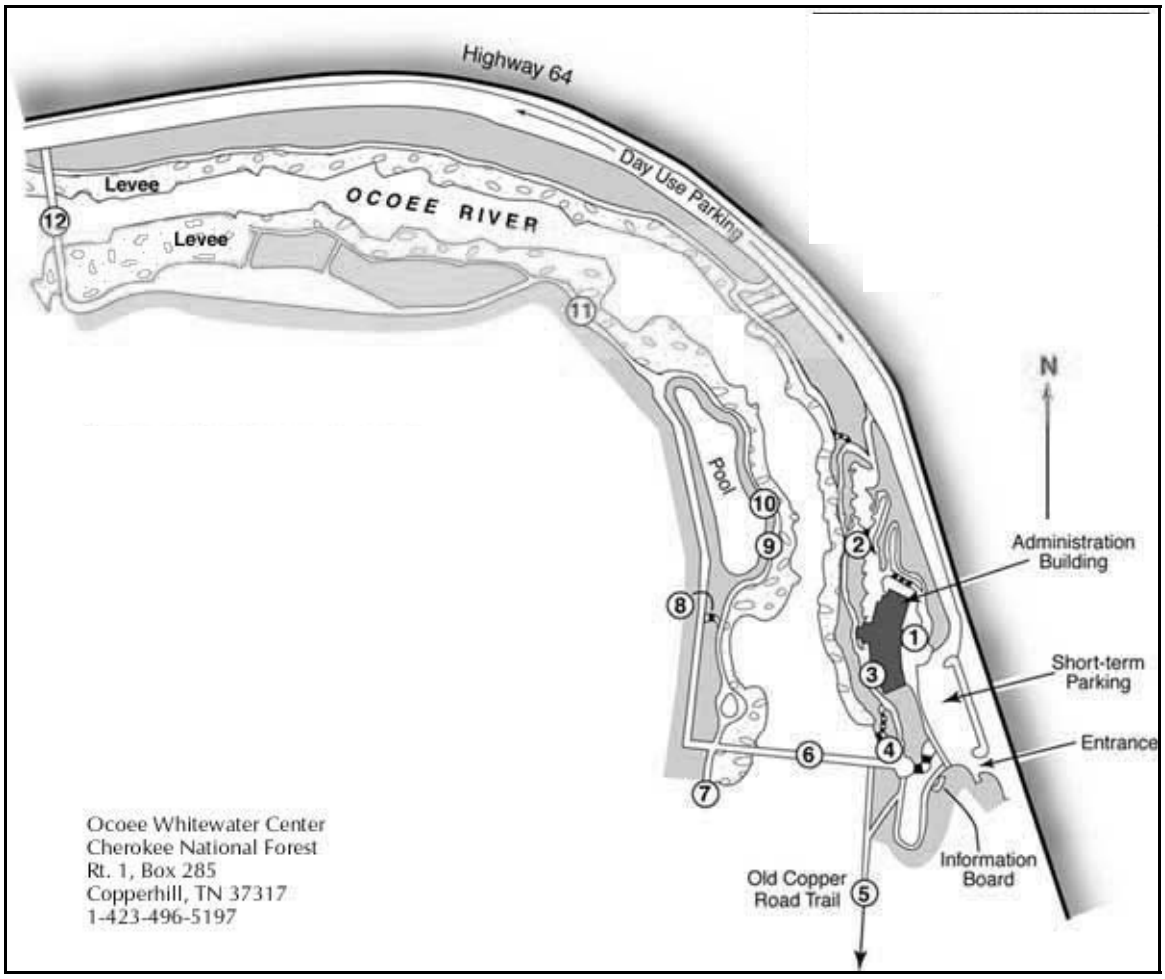
Images and Site Plans of Existing & Proposed Whitewater Parks

Instream Parks

Truckee River Whitewater Park at Wingfield (Reno, NV)

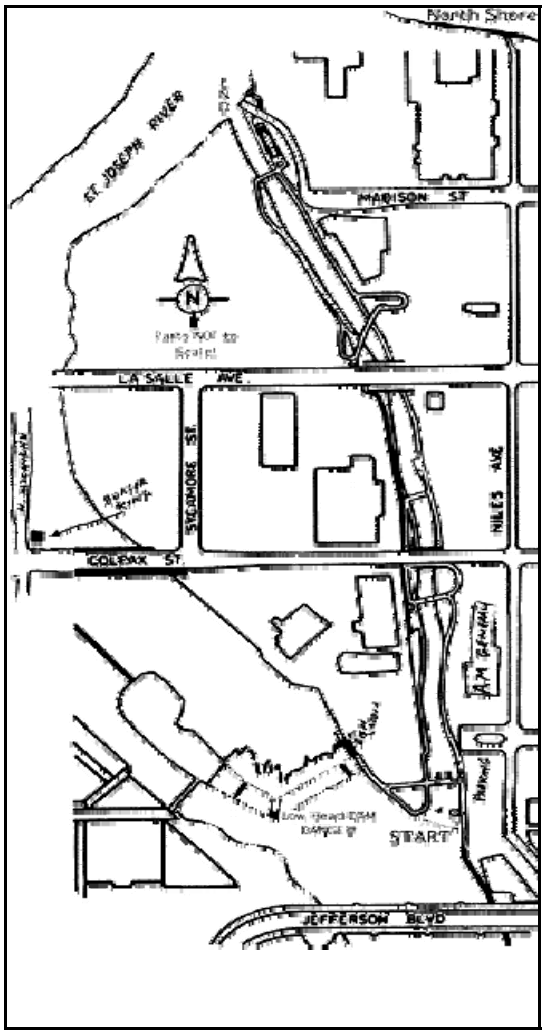
Clear Creek Whitewater Park (Golden, CO)

Arkansas Whitewater Park and Greenway (Salida, CO)



Ocoee Whitewater Center (Copperhill, TN)

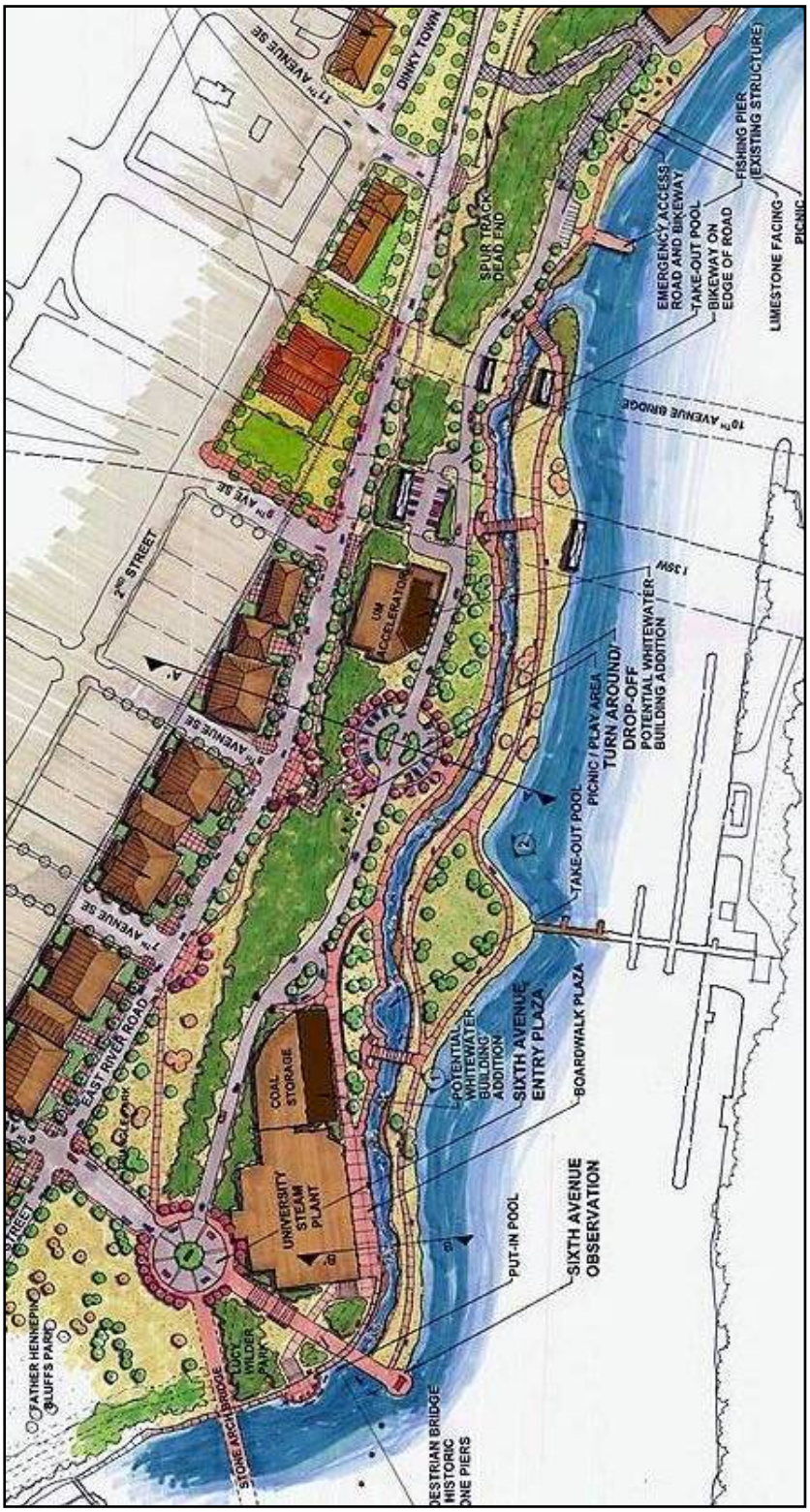
Artificial Channel Parks



East Race Waterway (South Bend, IN)

U.S. National Whitewater Center (Charlotte, NC)

Adventure Sports Center International (McHenry, MD)



Mississippi Whitewater Park – Proposed (Minneapolis, MN)

APPENDIX D

SUMMARY OF BOATING AND OTHER FEES AT ARTIFICIAL CHANNEL WHITEWATER PARKS

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Table D-1. Summary of boating and other fees at artificial channel whitewater parks.

Name of Park	Boating Fees				Other Fees
	Rafting (individual)	Rafting (group)	Kayaking/Canoeing (private boats)	Other Boating	
East Race Waterway (South Bend, IN)	Raft rental is $4 per person per ride (park provides rafts and shuttles rafts back to start)	$16-24 (no per raft fee as all fees are per person, but larger rafts can carry up to 6 people, while smaller rafts carry 4 people)	$12 for all-day private boater pass; kayakers carry their boats 3 city blocks back to start of course using the course-side pathway.	Park also rents "duckies" (inflatable kayaks) for same $4 per ride fee as for rafting.	None
US National Whitewater Center (Charlotte, NC)	May - September: $39-65 per person (fees are lowest on weekdays); October - April: $35-49 per person (fees are lowest on weekdays).	May - September: $234-390 per 6 person raft (fees are lowest on weekdays); October - April: $210-294 per 6 person raft (fees are lowest on weekdays).	$20/day, $125/month, or $175 for 10 day pass (year round).	None	All park visitors pay a parking fee of $5 per day per vehicle, or $35 annually. Fees are charged for kayaking instruction, rock climbing, challenge course and zip lines, and gear rental.
Adventure Sports Center International (McHenry, MD)	Summer weekends: $60 for youth (<12 years old), $75 for adults; Summer weekdays and Spring and Fall: $55 for youth (<12 years old), $65 for adults	Summer weekends: $425 for 6 person raft, and $270 for 3 person "High Adventure" raft; Summer weekdays and Spring and Fall: $375 for 6 person raft, and $225 for 3-person "High Adventure" raft; Groups of 12 or more are charged the $55-60 youth rafting fee.	$20 for 1/2 day (morning or afternoon session), $25 for full day (both sessions); also have option of $100 week pass or a $400 season pass.	Duckie rental: During the summer, $90 for a single, and $150 for a double, Spring and Fall, $80 for a single and $125 for a double. New or inexperienced paddlers are required to have a duckie lesson, which is $80 on weekdays and $90 on weekends.	Fees are charged for kayaking and climbing instruction, and self-guided climbing.
Notes: The Mississippi Whitewater Park (Minneapolis, MN) feasibility study proposes a $12 entrance fee. The boating fees that could be charged at the proposed Trinity River Whitewater Park in Dallas, TX are not known.					

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APPENDIX E

SUMMARY OF FINANCIAL DATA FOR TWO NEW ARTIFICIAL CHANNEL WHITEWATER PARKS

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Summary of Financial Data for Two New Artificial Channel Whitewater Parks

Table E-1. U.S. National Whitewater Center.

Financial Parameter	**$ x 1000**
I. ASSETS AND LIABILITIES	
Total assets	**$36,196**
Current assets	$4,061
Long-term assets	$32,135
Total liabilities	**$39,553**
Current liabilities	$2,553
Long-term liabilities	$37,000
Total Net Assets	**($3,357)**
II. REVENUES AND EXPENSES	
Direct revenue generation	**$8,429**
Paddlesports	*$3,216*
Food and beverage	*$1,931*
Local government service fee	*$1,714*
Climbing, ropes course, etc.	*$579*
Retail	*$625*
Other revenue sources	*$360*
Contributions, donations, other support	**$576**
Operating expenses	**$10,148**
Interest	*$2,316*
Recreational operations	*$2,147*
Salaries and payroll taxes/fees	*$1,430*
Depreciation	*$1,033*
Utilities	*$844*
Restaurant operations	*$616*
Retail operations	*$335*
Land lease [1]	*$324*
Insurance	*$245*
Other expenses	*$858*
Profit (change in net assets)	**($1,143)**
Capital Investment (construction loans)	$38,000
Indirect revenue generation [2]	$37,000

1. *Land is leased from Mecklenburg County, and rent is returned to USNWC as an in-kind donation.*
2. *Statement from park designer and USNWC Board Member Scott Shipley, regarding first year of park's operation, Whitewater Courses and Parks Conference, April 18-20, 2007.*

Source: USNWC Financial Statement for year ending October 31, 2007.

Table E-2. Adventure Sports Center International.

Financial Parameter	**$ x 1000**
I. CAPITAL COSTS (estimated)	
Acquisition (local developer donated land)	$0
Design	$1,400
Construction	$19,048
Equipment	$250
TOTAL	**$20,698**
II. FUNDING SOURCES	
Federal	
Dept. of Agriculture	$150
Dept. of Commerce – Economic Development Administration	$2,500
Dept. of Health & Human Services – Office of Community Services	$1,743
State	
Board of Public Works – Program Open Space (land purchase)	$1,960
State of Maryland bonds	$1,770
Dept. of Natural Resources	$750
Dept. of Business & Economic Development	$4,000
Local Government	
Garrett County	$5,750
ASCI	$275
Private Donations (includes land donation by Wisp Resort)	$1,800
TOTAL	**$20,698**
Other private funding (bank loan for construction of headquarters/customer and training center building)	$2,850
Other Financial Operation Data	
Total Project Investment	**$24,000**
Projected operating budget	$2.1 million
Projected number of employees	
Full-time equivalent	9
Part-time	100
Number of employees as of April 2008 (start of 2nd season)	68
Projected number of people to be served annually	20,000
Tax impact projection (first full year of operation)	$8.5 million

Sources:

- *State of Maryland 2008 Bond Bill Fact Sheet.*
- *FHL Bank Atlanta Economic Development Program: brochure describing EDP funding for ASCI by a local member bank.*
- *Garrett County Republican, May 8, 2008: "Officials Approve Grant Application".*
- *Duane Yoder, Garrett County Community Action Committee, Inc./Treasurer and Board Member, ASCI, Inc.: undated presentation on ASCI funding and projected economic impact.*

APPENDIX F

FINAL STUDY PLAN

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Final Study Plan
Feather River Whitewater Boating Opportunity Feasibility Study

Study Guidance and Assumptions: The implementation of this feasibility study is guided by the terms of Settlement Agreement Section B101, which describes the participants in implementing the study and the required components of the study. The study will be conducted in consultation with signatory Parties of the Settlement Agreement, with the expectation that American Rivers, American Whitewater, and the City of Oroville may actively contribute to the completion of the study and participate in its funding. Overall study management, including schedule for study plan development, study implementation, and study completion is the responsibility of DWR.

The study scoping process defined the geographic scope of the study as the Project area or region (Section B101 defined region as Northern California, Northern Nevada, other nearby western states, or other appropriate analogs is possible). The study will utilize and build off of relicensing Study Report R-16 – Whitewater and River Boating, and other pertinent Oroville Facilities relicensing studies and ALP products. The Settlement Agreement indicates that this study will address two options for enhancing or creating whitewater boating opportunities: a non-park option and a park option.

The non-park option for enhancing whitewater boating opportunities in the Project area or region may include enhancements to river access at existing whitewater boating areas, provision of vehicle shuttle services to improve boater access and reduce parking constraints, or provision of an on-water shuttle service to reduce flatwater paddling required after completion of runs.

The park option for providing new whitewater boating opportunities includes two types of parks: instream and artificial channel. Instream whitewater parks typically are created with man-made structures to constrict and direct water flow in an existing natural channel and thus create flow conditions attractive to whitewater boaters with waves, pools, drops and eddies. These structures may be constructed of native or non-native natural materials such as boulders and rock slabs, which are typically fixed in place with cement grout, and/or with engineered cement barriers. Artificial channel whitewater parks are constructed in an existing canal or flume, in an artificial channel created adjacent to a natural or artificial channel, or with an artificial channel unconnected to a natural channel. Like whitewater parks created in a natural channel, artificial channel parks use boulders fixed in place or man-made barriers (of cement, fiberglass, or other man-made materials) to create the desired flow characteristics. These barriers may be designed to be movable to allow changes in the course. The artificial channel park may use water diverted from an existing channel or may use water pumped from another source, with pumps used to recirculate the water from a pool at the end of the park's course to an elevated pool at the start of the park's course.

The study will consider park concepts that have already been identified (for example, within the City of Oroville's Whitewater Park Resource Action (PM&E) Identification

Form) as well as new potential opportunities not already identified. A total of 3 to 5 park and 3 to 5 non-park concepts will be assessed. It is expected that the study will evaluate park and non-park concepts both inside and outside the FERC Project boundary.

Study Purpose: Implement Section B101 of the Settlement Agreement for Relicensing of the Oroville Facilities, signed March 2006. Under the terms specified in Section B101, the Licensee is to initiate and fund a feasibility study to assist the Project Supplemental Benefits Fund Steering Committee (SBF Committee) in determining whether to fund the construction and operation of such a project, or cost share on a project, pursuant to their funding criteria.

Study Objectives: As stated above, the study purpose is to determine the feasibility of constructing and operating whitewater boating (park and non-park) facilities and/or cost sharing such a project in the Project area or region. Specific objectives to achieve this purpose are to:

1. Identify 3 to 5 viable whitewater park concepts, and viable sites that could accommodate those concepts, in the Project area or region;

2. Identify 3 to 5 viable non-park concepts in the Project area or region (sites would be inherent in the concepts, each to be associated with existing whitewater river runs);

3. Evaluate and compare the 3 to 5 viable park and non-park concepts and provide conclusions regarding the feasibility of constructing and operating whitewater boating (park or non-park) facilities in the Project area or region.

Study Phases and Tasks: To facilitate the review of work products by the SBF Committee and other study collaborators and to obtain important input at critical milestones, the study has been split into two phases. Phase 1 is focused on developing the study scope and on collecting and compiling information on existing and proposed whitewater parks, and supply and demand for whitewater boating opportunities in Northern California and Northern Nevada, that is relevant to Phase 2 tasks. Phase 2 is focused on identifying viable park and non-park concepts and potential sites for a whitewater facility in the Project area or region, and determining the feasibility of those options.

The following six tasks would be completed in conducting the study.

PHASE 1: DEVELOP STUDY SCOPE AND COMPILE RELEVANT BACKGROUND INFORMATION

Task 1. Conduct a scoping process to determine the necessary geographic and content scope of the study consistent with the intent of Settlement Agreement Section B101.

Between March 2006 when the Settlement Agreement was signed and January 2007, DWR and its consultants collaborated with representatives of American Rivers, American Whitewater, and the City of Oroville to discuss and draft a scope of work for this study. The Draft Scope of Work produced by this collaboration dated January 30, 2007 was used as the basis for this more detailed Draft Study Plan. An additional scoping meeting was held by DWR, its consultants, and American Whitewater during July 2007, as the first draft of the Draft Study Plan neared completion.

Task 2. Assess existing supply and demand for whitewater boating opportunities in the Project area and region to help define the market that could potentially be served by enhanced or new whitewater boating opportunities.

Subtask A: Assess the existing supply of whitewater boating opportunities in the region

This task will provide information on the current supply of whitewater boating opportunities in the region that may serve as substitutes for potential opportunities in the Project area or region. The assessment of supply will be based on a review of existing and proposed non-park whitewater boating opportunities within the portions of the Northern and Central Sierra and Northern Coastal Mountain areas in Northern California and Northern Nevada, within about a 3 hour drive from the Project area. This area defines the region likely to contain substitutes for opportunities in the Project area and surrounding communities. Only one whitewater park currently exists in the region; that facility will be addressed under Task 3. This assessment will be based on widely available printed sources, such as guidebooks, and on web-based research. Information to be compiled on these opportunities will include, at a minimum, the following characteristics: location, distance from the Oroville area and regional population centers, difficulty and length of runs, seasons of use, scenic values, ease of access, and availability of other recreation facilities such as campgrounds.

Subtask B. Assess whitewater boating demand in the region

This task will assess the demand for enhanced whitewater boating opportunities or a whitewater boating park in the Project area or region. Existing and future demand for whitewater boating opportunities will be evaluated in light of the existing and proposed supply of whitewater boating opportunities in the region (Subtask A), and in reference to the regional area described under Subtask A.

Because regional data is scarce, assessment of demand will include review of recent whitewater boating trends in the state and western U.S. that may have implications for the Project area or region. This assessment will also consider the likely market area for

enhanced whitewater boating opportunities in the Project area or region, based on the best available survey and other research data available. Whitewater boating activities will focus on kayaking and rafting. Likely sources of trend data include the US Forest Service's National Survey on Recreation and the Environment (NSRE), California Department of Parks and Recreation (DPR) surveys, and Outdoor Industry Association (OIA) or paddle sport industry reports or data.

Additional demand factors to be assessed include user preferences related to a potential facility, such as preferred class level (difficulty rating) of run, boating purposes served, and desired facility features and amenities. The expected characteristics of users of a potential whitewater park in the Project area or region will be described based on the characteristics of users of existing facilities investigated under Task 2, and any data available from national and state-wide recreation participation surveys (NSRE, DPR, OIA, etc.) that include whitewater boating or closely related activities. This task will consider information presented in Study Report R-16 – Whitewater and River Boating Study. This will include survey and focus group data on whitewater boater demographics and likely use levels of Butte County whitewater opportunities that could be enhanced, with the recognition that the value of this data will be limited by the small sample size, and will need to be supported by additional new data collected for this study.

Task 3: Characterize key features of existing and proposed whitewater boating facilities in the U.S.

This task will characterize key aspects of representative existing and proposed whitewater boating facilities, including instream and artificial channel parks, in the U.S. A preliminary list of representative facilities to be evaluated includes the following:

	Instream Parks	
1	Truckee River Whitewater Park at Wingfield	Reno, NV
2	Clear Creek Whitewater Park	Golden, CO
3	Arkansas River Whitewater Park	Salida, CO
4	Ocoee Whitewater Center	Ducktown, TN
5	Trinity Park Whitewater Course	Fort Worth, TX
	Artificial Channel Parks	
6	East Race Whitewater Course	South Bend, IN
7	US National Whitewater Center	Charlotte, NC
8	Adventure Sports Center International	McHenry, MD
9	Mississippi Whitewater Park (proposed)	Minneapolis, MN
10	Gateway Park Whitewater Course (proposed)	Fort Worth, TX

Each of the whitewater boating facility will be characterized in terms of the following features:

1. Recreational boating opportunities provided
    a. Types of boating supported (types of craft used, difficulty level or class)

    b. Boating purposes supported (recreational use by individuals and groups, training, competitions, other special events)
    c. Course layout (i.e., linear course or “loop” course)
    d. Flow levels provided
2. Spectator and other non-boating recreational amenities and opportunities provided
3. Availability of other recreation facilities nearby (e.g., campgrounds)
4. Seasonal availability
5. Use levels
6. User characteristics (frequency of use, distance traveled, origin of visitors, demographics)
7. Ease of access
8. Scenic attributes/values
9. Financial characteristics
    a. Fee Structure (if any)
    b. Direct and Indirect Revenue Generation
    c. Operating Expenses
    d. Profit
    e. Capital Investment/Financing
    f. Insurance Requirements
10. Ownership and Management Structure

Information will be obtained about these facilities utilizing web-based research, supplemented by telephone interviews with facilities owners/operators, as needed. No site visits are assumed. If sufficient information is not available for some of the boating facilities listed above, information will be obtained for facilities constructed at other U.S. locations, including Casper WY; Missoula MT; Wausau WI; Vail, Lyons, and Estes Park, CO; Horseshoe Bend ID; and others.

This assessment will allow the study team and the SBF Committee to gain a sense of the range of existing and proposed whitewater boating facilities and an understanding of key aspects of their recreational use and operational characteristics that could be relevant to a potential future whitewater park in the Project area or region. This assessment will also help inform the development of potential park concepts.

PHASE 2: IDENTIFY, EVALUATE, AND COMPARE VIABLE PARK AND NON-PARK CONCEPTS AND POTENTIAL SITES FOR A WHITEWATER PARK

Task 4. Identify viable concepts and sites for the whitewater park option in the Project area or region

Subtask A. Identify viable whitewater park concepts

This task focuses on identifying 3 to 5 whitewater park concepts. Concept viability will be determined based on consideration of the adequacy of existing and proposed whitewater boating opportunities in the region. Information from the supply and demand assessments in Task 2 will be used for making this determination. The concepts identified as viable will be described in terms of boater access, type of boating provided, length of run(s), number of whitewater features, and non-boating amenities. The selected concepts would present a range of possibilities (i.e., from the smallest in scale and potentially least complex and costly to implement, to the largest in scale and potentially most complex and costly). It is expected that 3-5 park concepts will be developed. To illustrate, the range of options for a whitewater park could extend from an instream park with a short run and a few play areas to a larger artificial channel park with multiple play areas, and several amenities for spectators and non-boaters.

Subtask B. Identify viable whitewater park sites

Because the park concepts identified in Subtask A would not be associated with a specific site, Subtask B will be identify and evaluate potential park sites. To identify viable sites for a whitewater boating park, candidate sites will be evaluated against a set of general siting criteria. Input will be sought from the SBF Committee on an initial list of candidate sites. As many as 10 sites would be initially evaluated. (It is expected that this initial list of sites will include those that have already been identified within the City of Oroville's "Whitewater Park" Resource Action (PM&E) Identification Form, Study Report R-16, and other ALP products.) The initial list of candidate sites will be screened based on a set of evaluative physical, environmental, and economic criteria. Preliminary evaluative criteria include:

Physical:	Flow of water available is adequate and not excessive
	Adequate natural gradient is available
	Little or no private property ownership
Environmental:	Little or no presence of special status species or protected habitat
	Little or no conflict with fish passage or river habitat
	Little or no flooding potential
	Little or no impacts to cultural resources
Economic:	Reasonable site acquisition costs

We will work with the SBF Committee to refine the site evaluation criteria that will then be used to initially evaluate the potential viability of sites. Sites will be eliminated from further consideration if the evaluation indicates that a "fatal flaw" exists in regard to one or more of these criteria. All candidate sites must be consistent with local and regional planning guidelines, including zoning and land use policies and regulations. This consistency determination will be made by the SBF steering committee.

Potential whitewater park sites remaining after the initial screening will be subject to a more detailed secondary evaluation. The intent of the secondary evaluation is to identify two or three most favorable or preferred sites that could be subject to a detailed, pre-design assessment. The secondary evaluation will include consideration of additional physical and environmental evaluative criteria, including the following:

1. Physical Criteria
    a) Gradient
    b) Flow
    c) Land ownership/use
    d) Parking/access
    e) Available infrastructure (potable water, sanitary sewer, electricity, telephone)
    f) Potential length of run(s)
    g) Available space for spectating, optional amenities
    h) Aesthetics
    i) Safety/security
2. Operational Requirements
    a) Security
    b) Regulatory flow and temperature requirements
    c) Power generation
    d) Water supply
    e) Flood control operations
3. Typical Whitewater Park Operational Criteria
    a) Diurnal (potential constraints on daily operations at site)
    b) Seasonal (potential seasonal constraints on operation at site)
4. Environmental Constraints
    a) Flooding potential
    b) Special status species/habitat
    c) Fish passage/river habitat
    d) Water temperature
    e) Other potential water quality/quantity impacts
    f) Cultural resources
5. Permitting/Approval Considerations
    a) Federal
    b) State
    c) Local

The secondary evaluation will be conducted at a reconnaissance level, including site visits to candidate sites to obtain needed information. The evaluation for each site will be conducted within a scale range that is most appropriate to the conceptual level of the evaluation, from approximately 1 inch = 500 to 1 inch = 1,000 feet.

Task 5. Identify viable concepts for the non-park whitewater option in the Project area or region.

This task will identify 3 to 5 viable non-park concepts in the Project area or region. A list will be compiled of existing whitewater runs in the region known to be of interest to boaters but the use of which is constrained by access or related issues, and which therefore might be enhanced by improved parking, boater access, shuttle services, or other enhancements. Supply information compiled in Task 2, Subtask B, including current access to runs at both put-in and take-out locations, will be used to develop this information. Information also will be gathered and evaluated on the performance of recent enhancements to access and shuttle services for existing Feather River watershed whitewater runs in increasing boater interest or use.

Task 6. Evaluate and compare concepts for whitewater boating opportunities in the Project area or region (including economic analysis) and determine feasibility of the concepts and sites

This task will evaluate and compare the 3 to 5 park concepts in association with specific sites (identified in Task 4) and 3 to 5 non-park concepts (identified in Task 5) to identify potentially feasible park and non-park concepts that the SBF Committee may elect to consider for implementation. The evaluation will introduce additional social and economic criteria to fulfill the requirements of SA Section B101, including the following:

1. Social Criteria
    a) Potential user types and numbers
    b) Competing natural and artificial whitewater opportunities
    c) Potential non-boater (spectator) visitation
    d) Competing/conflicting recreation uses

2. Economic Impacts/Opportunities and Constraints
    a) Estimated conceptual costs (construction and O&M), including costs related to the provision of off-site infrastructure and road access
    b) Ownership, management, and financing options
    c) Revenue generation potential
    d) Impacts on local economy/economic development benefits
    e) Linkages with local community and other recreation opportunities or venues

These criteria will be introduced at this stage of the study to assess the feasibility of implementing selected concepts at specific sites. Each concept and site combination will be evaluated using the previously identified site evaluation criteria, including the social and economic criteria listed above. The social and economic criteria are intended to provide a basis for judging the potential of various concepts to attract whitewater boating visitors (participants and spectators) and the economic impacts associated with that visitation and a basis for comparing that potential with potential costs. This comparison is considered to be a key input to the SBF Committee in assisting them in their decision whether to fund a whitewater project in the region.

Results of this evaluation will be summarized in a matrix of the alternative sites and options describing the opportunities and constraints of each concept and site combination in relation to the evaluation criteria. Positive/neutral/negative ratings or numerical ratings (e.g., 1 to 4, with 1=poor, 2=good, 3=better, 4=best) may be applied to facilitate comparison of concepts and options. Although review of potential economic impacts/opportunities and constraints will be necessarily broad due to the conceptual nature of the park and non-park options, the assessment will be sufficiently detailed to allow the SBF Committee to determine the potential economic feasibility of constructing and operating a project in the region.

Deliverables:

Item	Expected completion date
• Draft Study Plan	January 2008
• Final Study Plan	July 2008
• Draft Phase 1 Study Report	August 2008
• Final Phase 1 Study Report	September 2008
• Draft Study Report (Phase 1 and 2)	December 2008
• Final Study Report (Phase 1 and 2)	January 2009
• SBF Committee Presentation	Spring 2009

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