



Section E

INTEGRATION OF WATER MANAGEMENT STRATEGIES

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Section E

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E. INTEGRATION OF WATER MANAGEMENT STRATEGIES

Section E Summary – Many of the water management strategies identified in Section D are complementary and may be integrated to avoid duplication of effort, address common issues, provide for cost savings, allow for cost sharing, and optimize attainment of IRWM Plan goals and objectives. As a guide to the Region's water resources planning effort, this section identifies groups of water management strategies that can be combined to (1) mutually support attainment of Plan objectives, and (2) provide additional economic, social, water resources, or implementation benefits. The identified groups of integrated strategies address all nine Plan objectives, and incorporate all water management strategies mandated by the State's IRWM Planning Guidelines.

E.1 Overview

Purpose of Integration. This section presents the mix of water management strategies selected for inclusion in the IRWM Plan and describes how the strategies work together to achieve the IRWM Plan objectives.

As discussed in Section C, IRWM Goal 4 (coordinate and integrate water resource management) recognizes that integrating multiple water management strategies:

- is required by State IRWM Plan Guidelines (both within the 2004 and 2007 versions of the Guidelines),
- is required to address Region's complex water management issues and optimize attainment of the nine Plan objectives, and
- may yield synergistic effects through combining multi-purpose water management components.

Integration Approach. A two-step process is used herein to identify groups of strategies that work together to mutually support Plan objectives and provide additional economic, social, environmental, or water resource management benefits.

- 1. Identify Primary Water Management Strategies that Directly Address Plan Objectives.** In this step, water management strategies are reviewed to identify which strategies best support the Plan objectives. This step is described in Section E.2.
- 2. Develop Integrated Strategy Groupings for Each Objective.** Once the strategies that best address each objective have been identified, the strategies can be integrated (combined) with other compatible secondary strategies to achieve each objective. This step is described in Section E.3

The resulting integrated strategy groups may be used as a roadmap or template for developing prioritizing integrated groups of projects (see Section F) that achieve the Plan objectives.

E.2 Water Management Strategies that Directly Address IRWM Plan Objectives

The nine objectives address diverse water management needs. These nine objectives address both the process by which IRWM planning is to occur within the Region, and the specific ways in which physical water resources are to be managed.

Overarching IRWM Planning Objectives. The nine IRWM Plan objectives do not all directly address means of managing physical water resources. The first three of the IRWM Plan objectives address the process and methods by which IRWM planning will be conducted within the Region.

IRWM Plan Objectives A, B, and C Overarching Planning Objectives

IRWM Plan Objectives A, B, and C address the overall process and methods in which the Region's IRWM projects are to be planned and implemented. These overarching planning objectives address how the IRWM process is to emphasize stakeholder involvement, data management, and scientific/technical understanding.

Objective A (maximize stakeholder/community involvement and stewardship) emphasizes the importance and need for public involvement within the Region's IRWM planning process. Objective B (effectively obtain, manage, and assess water resources data) and Objective C (further the scientific and technical foundation of water quality management) reflect the need and importance of data management and additional scientific research in assessing and managing the Region's water resources.

While Objectives A, B, and C are of great importance in defining how IRWM planning is to be conducted, the objectives do not address any specific water resources. As a result, these three objectives do not lend themselves to becoming the central focus around which to construct integrated projects, but they are key to successful integration by bringing together partners for implementation and measuring success.

IRWM Plan Objectives Selected as Focus for Developing Integrated Groups. The remaining six IRWM Plan objectives (D, E, F, G, H, and I) address how to manage or use the Region's groundwater or surface water resources. Because each of these six objectives addresses water resources or how the resources should be managed, the six objectives represent excellent starting points around which to build groups of integrated water management strategies.

Objective D: Develop and Maintain a Diverse Mix of Water Resources

The first group of integrated water management strategies is constructed around Objective D (develop and maintain a diverse mix of water resources). Primary water management strategies (see Table D-5 on page D-18) that directly support achieving a diverse mix of water resources include:

- agricultural water use efficiency (#2),
- groundwater management (#4),
- conveyance (#5),
- seawater desalination (#6),
- potable water treatment and distribution (#7),
- groundwater aquifer remediation (#11),
- recycled water (#16),
- urban water use efficiency (#22), and
- water transfers (#23).

Strategies to address the Region's need for water supply diversity have already been identified within the Region's local water plans. Water conservation (urban and agricultural water use efficiency) is a fundamental component of the water supply diversity plans of the Water Authority and local water agencies. As described in Section B.10, water conservation represents the most economical source of supply for the Region. Groundwater management, seawater desalination, recycled water, potable water treatment and distribution, conveyance, and water transfers are all key elements of the Region's water supply plans. This IRWM Plan

(see Section C) develops specific targets for each of these water sources. Each of the primary integrated strategies that address water resources diversity are complementary. As documented in Section B.10, implementation of all of these source water diversity strategies will be necessary to meet the Region's water supply needs.

Groundwater strategies represent an important component in water supply diversity within the Region. Groundwater management can be used to store water derived from other sources to balance out seasonal differences between supply availability and demand. Groundwater aquifer remediation is necessary to support groundwater management, as contamination issues affect several of the Region's key aquifers that represent existing or potential sources of potable water supply (e.g. Mission Basin, Mission Valley, Santee/El Monte Basin).

Objective E: Construct, Operate, and Maintain a Reliable Water Infrastructure System

The second group of integrated water management strategies is constructed around Objective E (construct, operate, and maintain a reliable water infrastructure system). Four primary water management strategies (see Table D-5 on page D-18) directly support achieving the Region's water infrastructure reliability needs:

- conveyance (#5),
- potable water treatment and distribution (#7),
- regional reservoir storage (#18), and
- reoperation and reservoir management (#19).

The Region's water supply master plans, urban water management plans, and capital improvement programs identify increased storage, increased supply diversity, reoperation and reservoir management, increased potable treatment capacity, and upgrades to the Region's conveyance system as key to addressing the Region's water infrastructure reliability issues. Several significant region-wide infrastructure improvements are included within the Water Authority's ESP.

Conveyance, potable water treatment and distribution, reservoir storage, and reservoir management are interrelated and complementary. Each of the strategies are dependent on each other, each affects the other three, and each of the four is necessary to address water infrastructure reliability needs within the Region.

Objective F: Minimize the Negative Effects on Waterways and Watershed Health Caused by Hydromodification and Flooding

The third group of integrated water management strategies is constructed around Objective F (minimize the negative effects on waterways and watershed health caused by hydromodification and flooding). Five primary water management strategies address hydromodification and flooding:

- agricultural land management (#2),
- floodplain management (#10),
- urban land use management (#20),
- urban runoff management (#21), and
- watershed management and planning (#25).

Combining these strategies is necessary to address the Region's complex runoff, erosion, and sedimentation issues. Agricultural land stewardship and urban land use management can reduce agricultural and urban land sources of runoff and sediment loads. Agricultural land uses (addressed by agricultural land stewardship strategies) can significantly affect storm runoff, flooding, erosion, floodway channels, and sedimentation. Controlling urban runoff is also key to addressing the Region's hydromodification and flooding issues.

Floodplain management has a direct effect on agricultural land use, land use management, and watershed planning. Urban runoff management can address runoff volume and sedimentation issues. Watershed-specific elements of agricultural land stewardship, floodplain management, and urban land management can be addressed within watershed plans.

Objective G: Effectively Reduce Sources of Pollutants and Environmental Stressors

The fourth group of integrated water management strategies is constructed around Objective G (effectively reduce sources of pollutants and environmental stressors). As shown in Table D-5 (page D-18), primary water management strategies that directly address pollution management include:

- agricultural land stewardship (#2),
- pollution prevention (#13),
- urban land use planning (#20),
- urban runoff management (#21), and
- watershed management and planning (#25).

Control of both agricultural and urban sources of pollution is required to attain the Region's water quality standards. Agricultural land stewardship can be used to address pollution sources on agricultural lands, while urban land use planning can be used to address pollution activities and land uses in urban areas. Urban runoff management complements pollution prevention through the control of urban flows and the reduction of runoff. Watershed management and planning can be used to identify watershed-specific water quality improvement priorities and plans for implementing the priorities.

Objective H: Protect, Restore, and Maintain Habitat and Open Space

The fifth group of integrated water management strategies is constructed around Objective H (protect, restore, and maintain habitat and open space). Five primary water management strategies (see Table D-5 on page D-18) directly address habitat and open space:

- agricultural land stewardship (#2),
- groundwater management (#4),
- ecosystem restoration (#9),
- recharge area protection (#15), and
- urban land use management (#20).

While ecosystem restoration is the primary water management strategy for restoring habitat, habitat restoration can also occur as part of agricultural land stewardship. Agricultural land stewardship and recharge area protection represent important strategies for preserving open space, restoring and maintaining habitat, and improving water quality. Additionally, both of these strategies can support ecosystem restoration efforts. Groundwater management is required to ensure the sustainability of groundwater-dependent habitat. Groundwater management can also be coordinated with ecosystem restoration, urban land use management, and recharge area protection to preserve open space and improve water quality required to sustain ecosystems.

Objective I: Optimize Water-Based Recreational Opportunities

The sixth group of integrated water management strategies is constructed around Objective I (optimize water-based recreational opportunities). Primary water management strategies that directly support optimizing water-based recreation within the Region include:

- ecosystem restoration (#9),
- pollution prevention (#13),
- urban runoff management (#21), and
- water-based recreation and public access (#24).

As discussed in Sections B.5 and B.8, water-based recreation can be significantly impacted by bacterial pollution. Pollution prevention and urban runoff management is required to address and reduce these bacterial loads. Conversely, some recreational uses can impact water quality. Ecosystem restoration can complement recreation through enhanced aesthetics and improved nature/habitat-related recreational opportunities. Ecosystem restoration and recreation needs must be balanced to insure that recreation does not adversely affect ecosystems through encroachment or water quality degradation.

E.3 Additional Water Management Strategies Linked to Integrated Groups

The second step of the integration process is to identify additional (secondary) water management strategies that are linked with or complement the primary water management strategies within each integrated group. To complete this step, it is first necessary to understand how water management strategies can be related (linked).

Connections (Linkages) Among Water Management Strategies. Implementing any particular water management strategy may have effects on other management strategies. Demonstrating this, Table E-1 (page E-8) presents a general summary showing which water management strategies affect each other. As shown in Table E-1, the effects are not necessarily symmetrical. Implementing one strategy may significantly affect a second strategy, for example, but implementing the second strategy may have no effect on the first strategy.

The interrelations and effects among water management strategies must be taken into account in determining how the water management strategies are best combined (integrated) to address the Region's water needs. Several important relations (linkages) among the water management strategies are useful in identifying how strategies may be integrated to maximize benefits and minimize the potential for conflict.

- *Strategies that mutually benefit each other.* Concurrently implementing strategies that mutually benefit each other can result in synergistic effects that help achieve water management objectives and increase the effectiveness of the individual water management strategies. Pollution prevention (#13) and urban runoff management (#21) represent an example of mutually benefiting strategies. By limiting sources of pollution, pollution prevention may reduce the volume of urban runoff flow. Urban runoff management strategies that divert or treat urban runoff can achieve pollution reduction.

Table E-1
General Interrelations Among IRWM Plan Water Management Strategies

No. ¹	Management Strategy	Water Management Strategies that May be Affected by Implementing the Strategy Listed in the Left-Hand Columns																					
		2	3	4	5	6	7	8	9	10	11	12	13	15	16	18	19	20	21	22	23	24	25
2	Agricultural Land Stewardship	●		○				●	●		○	○	○	○	○	○	○	○	●			○	○
3	Agricultural Water Use Efficiency		●	○	○	○	●	○			●		○	●	○	○	○	●	●	●	○	○	○
4	Groundwater Management	○		●		○		●	○	●	○		○	●	●	○						○	○
5	Conveyance		●	●		●	●			●			●	●	●						●		
6	Seawater Desalination			●		○		●							○						○		
7	Potable Water Treatment and Distribution			●		●															●	●	○
8	Economic Incentives	●	●	●		●		●			●	●	●	●	●			●	●	●		●	●
9	Ecosystem Restoration	●		●			○		●		●			○	○	○	○	●	●		●	●	○
10	Floodplain Management	●						●	●				○					●			○	○	○
11	Groundwater Aquifer Remediation			●			○			●	●	○	○										○
12	Matching Quality to Use	○	○	○	●			●	●	○		●		○	○	○	○	○	○	○	○	○	○
13	Pollution Prevention			○		●		●	○		●		○	○	○	○	●	●		●	●	○	○
15	Recharge Area Protection	○		●				●	○	○		○	●					○			○	○	○
16	Recycled Water	○		●	●					●	○		●		○	○							○
18	Regional Surface Storage			●	●						●		○	●	●	●	●	●	●	●	●	●	●
19	Reoperation and Reservoir Management				●		●							●							○		○
20	Urban Land Use Management	●		○			○		●	●		●	●	○		●	●	●	●	●	●	●	○
21	Urban Runoff Management			●			●		●	●		●		●	●	●	●	●	●	●	●	●	●
22	Urban Water Use Efficiency		●	●	●	●					●		●	●	●	●	●	●	●	●	●	●	●
23	Water Transfers			○	●									●	●	●	●						○
24	Water-Dependent Rec. and Public Access						●		●	○		○	○	○	●	●	●						○
25	Watershed Management and Planning	○	○	○			○	○	○	○		○	○	○	○	○	○	○	○	○	○	○	●

● Implementing the strategy in the left hand columns significantly and directly affects the strategy listed at the top of the table.

○ Implementing the strategy in the left hand columns may indirectly affect the strategy listed at the top of the table.

1 Water management strategies (see Section D) are numbered in accordance with the *California Water Plan Update 2005 Volume 2* chapter numbers that discuss each individual strategy.

- *Enhancing/enabling strategies.* Some strategies may enhance or enable implementation of other beneficial strategies. As an example, economic incentives (#8) may be used as a means of enhancing the potential for implementation of agricultural water use efficiency (#2), recycled water (#16), urban water use efficiency (#22), or other beneficial strategies.
- *Strategies that share a common purpose.* Concurrently implementing strategies that share a common purpose can broaden and increase overall benefits of the strategies. As an example, agricultural water use efficiency (#3) and urban water use efficiency (#22) both seek to conserve water and reduce water demands. Such strategies may share common implementation methodology (e.g. irrigation reduction demand methods may be applicable to both urban and agricultural uses). Implementing the strategies in combination can reduce overlap in effort, improve standardized water demand reduction practices within the Region, and improve technical coordination and efficiency.
- *Strategies that are directly interrelated.* Several of the water management strategies considered in this IRWM Plan are directly interrelated. Concurrently implementing such closely related strategies will provide complementary benefits. As an example, regional reservoir storage (#18) and reservoir reoperation and reservoir management (#19) both address surface storage capacity and reduce treatment requirements. Combining these strategies allows for multiple benefits, as reoperation can reduce storage infrastructure capacity needs through more efficient operation, and physical reservoir infrastructure can improve the efficiency of reservoir operation.
- *Strategies that have differing management needs.* Some strategies have differing water management needs that must be addressed in order to avoid conflict and to optimize benefit. As an example, groundwater management (#4) may affect groundwater-dependent habitat created as part of ecosystem restoration (#9). As a second example, water-dependent recreation and public access (#24) may have differing management needs than regional reservoir storage (#18) or reoperation and reservoir management (#19).

As shown in Table E-1 (page E-8), a myriad of potential combinations and variations exist for integrating water management strategies within the Region. While it would be possible to craft an integrated group that links and includes every single water management strategy, this IRWM Plan focuses on identifying select groups of strategies that can be integrated (combined) to:

- more efficiently and effectively address common regulatory, jurisdictional, data management, environmental, or economic challenges,
- provide for cost savings by economy of scale or by reducing duplicative facilities or operations,
- allow for cost sharing among cooperating agencies,
- address common water management challenges,
- minimize the potential for adverse impacts,
- increase public awareness and education and stakeholder involvement, or
- optimize attainment of IRWM Plan goals and objectives.

Integrated Strategies to Diversify Water Sources. Nine primary strategies directly support achieving water source diversity (see inset at right). On the basis of the significant and direct linkages identified in Table E-1, five additional strategies (secondary strategies) are added to form an integrated group of fourteen strategies that focuses on water resources diversity. Appendix 6 presents the justification for including each of the strategies within the integrated group.

Primary Water Management Strategies that Address a Diverse Mix of Water Resources
Agricultural Water Use Efficiency (#3)
Groundwater Management (#4)
Conveyance (#5)
Seawater Desalination (#6)
Potable Water Treatment and Distribution (#7)
Groundwater Aquifer Remediation (#11)
Recycled Water (#16)
Urban Water Use Efficiency (#22)
Water Transfers (#23)

Matching quality to use (#12), regional reservoir storage (#18), and reoperation and reservoir management (#19) are included in this integrated group, as these strategies must be coordinated with the water supply source strategies. Watershed management and planning (#25) is included, as this strategy may provide a forum for coordinating watershed-specific source water strategies. Economic incentives (#8) is also added to the integrated group to encourage local water supply diversity and supply development.

Potential benefits (see Appendix 6) associated with combining (integrating) the strategies of this group include:

- implementing provisions of the Region's local water plans that address the need for diversity of water supply sources,
- optimizing conveyance and water treatment infrastructure planning needs with source supply plans,
- coordinating groundwater supply and management with potential sources of groundwater recharge (e.g. untreated aqueduct water, recycled water, reservoir releases),

- reducing the Region's demands for both agricultural and urban water supplies, which in turn reduces facilities storage, treatment, and conveyance capacity needs, and supply source volumes,
- enhancing the reliability of the Region's water supply system by increasing the degree of diversity and flexibility in water sources,
- increasing the efficient use of local water sources through groundwater management, reservoir management, and matching quality to use,
- improving groundwater quality, and
- utilizing watershed planning as a tool to address water supply diversity issues.

As noted in Section D, all nine primary strategies within the integrated group are already part of water supply plans developed by the Water Authority and its member agencies.

Integrated Strategies to Improve Infrastructure Reliability. As documented in Section B, the Region is at the “end of the pipe” within California’s imported water supply system. Limited local storage capacity and local water production capacity renders the Region vulnerable to water supply shortages if the imported supply is interrupted.

Four primary water management strategies were identified in Section E.2 (see inset at right) that directly support improving the reliability of the Region’s water infrastructure. Six additional secondary strategies (see Appendix 6) are added to these four primary strategies to form a group of integrated water infrastructure reliability strategies.

Primary Water Management Strategies that Address Reliable Water Infrastructure

Conveyance (#5)
Potable Water Treatment and Distribution (#7)
Regional Reservoir Storage (#18)
Reoperation and Reservoir Management (#19)

Appendix 6 presents the rationale for how the water management strategies integrate to enhance the reliability of the Region’s water supply infrastructure. Groundwater management (#4), seawater desalination (#6), recycled water (#16) are added to the integrated strategies group, as water supply infrastructure needs are, in part, dependent on the location and type of water supply sources. Additionally, these local water sources add to the flexibility of local water agencies in responding to infrastructure-related issues such as conveyance breakdowns or interruptions in imported supply. The economic incentives (#8) strategy is added as a means of encouraging or enabling implementation of the strategies within the integrated group.

Agricultural water use efficiency (#3) and urban water use efficiency (#22) are added to the integrated group because these strategies result in reduced demands and a decreased likelihood of water supply shortages during periods of interrupted imported water supply. Additionally, the Region's treated imported water system may currently be incapable of meeting peak summer day water demands. Until additional treatment capacity is brought online, the Water Authority and its member agencies have instituted a Peak Demand Management Program. The program outlines conservation measures to be taken to reduce demands in the summer so that the Region will not face water supply reliability problems.

Appendix 6 also summarizes benefits associated with the integrated group of strategies. The integrated strategies will result in capital and operation and maintenance cost savings as a result of increased coordination of projects, improved system efficiency, and increased operation flexibility.

Integrated Strategies to Address Hydromodification

and Flooding. Hydromodification and flooding represent key water management problems in virtually all of the Region's hydrologic units (See Section B.2). As identified in Section E.2, five primary water management strategies (see inset at right) directly address hydromodification and flood effects.

Primary Water Management Strategies that Address Hydromodification and Flooding

- Agricultural Land Stewardship (#2)
- Floodplain Management (#10)
- Urban Land Use Management (#20)
- Urban Runoff Management (#21)
- Watershed Management and Planning (#25)

Two secondary strategies are added to these five primary strategies to develop an integrated group of strategies that supports reducing negative hydromodification and flood effects:

- economic incentives (#8) to encourage implementation of projects that address hydromodification and flooding needs, and
- ecosystem restoration (#9), which can include invasive species control and vegetation management within floodways to enhance flood control and reduce hydromodification effects.

Appendix 6 presents the integrated strategy group to reduce negative effects of hydromodification and flooding. As summarized in Appendix 6, integrating these seven strategies provide several benefits, including:

- coordinating agricultural practices, land planning, urban runoff control, and flood planning to limit sediment, erosion, and flood impacts,

- controlling invasive species by addressing both physical removal needs and eliminating (or minimizing) conditions that are conducive for the growth and propagation of invasive species, and
- addressing watershed-specific hydromodification and flooding needs as part of watershed management and planning.

Integrated Strategies to Reduce Pollutants and Stressors.

As documented in Section B.5, many of the Region's waters have been designated as impaired due to noncompliance with Basin Plan water quality objectives. Region-wide water quality constituents of concern include bacteria, sediment, and TDS. Four primary water management strategies (see inset at right) directly support the reduction of pollutants and environmental stressors.

Primary Water Management Strategies that Reduce Pollutants and Stressors

Agricultural Land Stewardship (#2)
Pollution Prevention (#13)
Urban Runoff Management (#21)
Watershed Management and Planning (#25)

These four primary management strategies are combined with six related strategies to form an integrated group of pollution control strategies. Linked secondary strategies included with this integrated group include:

- agriculture water use efficiency (#3) and urban water use efficiency (#22), which may enhance pollution control and urban runoff management by reducing irrigation runoff,
- ecosystem restoration (#9) strategies such as wetlands creation, which can be used as a means to improve or restore water quality in impacted areas,
- urban land use management (#20), which may be used as a means of limiting activities or land uses that create pollution,
- water-based recreation and public access (#24), which may affect water quality (recreation activities must be balanced against pollution control needs), and
- economic incentives (#8), which may be used as a means of encouraging implementation of pollution prevention projects.

Appendix 6 presents the rationale for including each of the strategies within the integrated group. Integrating the strategies provides such benefits (see Appendix 6) as:

- coordinating management of agricultural and urban sources of pollutants,
- reducing both pollutant flows and mass emissions through agricultural and urban water use efficiency, urban land use management, and urban runoff controls,
- providing for instream water quality improvement through ecosystem restoration,

- coordinating recreation opportunities with land use management and water quality improvement needs, and
- using water management planning as a tool to address watershed-specific pollution control needs.

Integrated Strategies to Restore and Protect

Habitat and Open Space.

Four primary water management strategies (see inset at right) directly support protecting, restoring, and maintaining habitat and open space. Seven related secondary strategies are added to form an integrated group that supports and complements habitat restoration and open space preservation.

Primary Water Management Strategies that Restore and Protect Habitat and Open Space

- Agricultural Land Stewardship (#2)
- Ecosystem Restoration (#9)
- Urban Land Use Management (#20)
- Watershed Management and Planning (#25)

Appendix 6 summarizes rationale for the primary and secondary strategies that comprise this integrated group. Coordination of groundwater management (#4), floodplain management (#10), pollution prevention (#13), recharge area management (#15), urban runoff management (#21), and recreation and public access (#24) can enhance ecosystem restoration, land conservation, recreational opportunities, water quality, and flood protection. Economic incentives (#8) can be combined with these integrated strategies to enhance implementation.

Integrated Strategies to Optimize Water-Based Recreational Opportunities.

As detailed in Section B.8, the Region supports a wide array of water-contact and non-contact recreation along inland surface streams, at inland water supply reservoirs, and within the Region's coastal waters. Bacterial pollutants (see Sections Section B.5 and B.8) represent the greatest impact on water-based recreation within the Region. Four primary water management strategies (see inset at right) were identified in Section E.2 that directly support optimizing water-based recreational opportunities within the Region.

Primary Water Management Strategies to Optimize Water-Based Recreational Opportunities

- Ecosystem Restoration (#9)
- Pollution Prevention (#13)
- Urban Runoff Management (#21)
- Water-Dependent Recreation and Public Access (#24)

Six related secondary strategies (see Appendix 6) are added to form an integrated group of strategies that address improving recreational opportunities without adversely impacting water supply and habitat uses. Regional reservoir storage (#18) and reoperation and reservoir management (#19) are included among the strategies linked to recreation, as reservoir-based recreational opportunities may be limited by water supply needs and other considerations.

Floodplain management (#10) and urban land use management (#20) are added to the integrated group, as these strategies can influence the amount, location, and types of land uses that are available for recreation. Economic incentives (#8) is added to the integrated strategy group to encourage implementation of projects that optimize water-based recreational opportunities in the Region.

As summarized in Appendix 6, the integrated strategies that support optimizing water-based recreation provide additional benefits, including:

- enhancing coordination of land use, floodplain management, ecosystem restoration, and recreation planning,
- enhancing surface water quality,
- coordinating reservoir operations and the need to limit recreation-related water quality impacts to surface supplies, and
- utilizing watershed management planning as a tool to address watershed-specific recreational opportunities.

E.4 Summary of Integration Benefits

Enhanced Attainment of IRWM Plan Objectives. While each of the integrated strategy groups are based around a specific IRWM Plan objective, the strategies within each integrated group also help to attain other Plan objectives.

Appendix 6 summarizes benefits associated with integrating the strategies. Table E-2 (page E-16) summarizes how each of the integrated strategy groups attain the Plan objectives. Each of the integrated strategy groups directly support attainment of three or more objectives.

As shown in Table E-2, integrated strategy groups that support hydromodification and flooding, pollution prevention, habitat and open space, and recreation directly achieve or indirectly help to achieve all nine objectives. Integrated strategy groups for source water diversity and water infrastructure reliability achieve or indirectly help to achieve seven or more of the objectives.

**Table E-2
IRWM Plan Objectives Achieved by Integrated Water Management Strategy Groups**

Purpose of Integrated Strategy Group	Primary Water Management Strategies within the Integrated Group	IRWM Plan Objectives Supported by the Water Management Strategy								
		A. Maximize Stakeholder/Community Involvement and Stewardship	B. Effectively Obtain, Manage and Assess Water Resources Data	C. Further Technical and Scientific Foundation for Water Management	D. Develop, Operate, and Maintain a Diverse Mix of Water Resources	E. Construct, Operate, and Maintain Reliable Water Infrastructure	F. Reduce Negative Effects of Hydromodification & Flooding	G. Reduce Pollutant Sources and Environmental Stressors	H. Protect, Restore and Maintain Habitat and Open Space	I. Optimize Water-Based Recreational Opportunities
Diverse Mix of Water Resources	Agricultural Water Use Efficiency (#3) Groundwater Management (#4) Seawater Desalination (#6) Groundwater Aquifer Remediation (#11) Recycled Water (#16) Urban Water Use Efficiency (#22) Water Transfers (#23)	● ^{1,2}	○ ²	○ ²	●	●		○		○
Reliable Water Infrastructure	Conveyance (#5) Potable Water Treatment and Distribution (#7) Regional Surface Storage (#18) Reoperation and Reservoir Mgt. (#19)	● ^{1,2}	○ ²	○ ²	●	●		○	○	○
Reduce Negative Hydromodification and Flooding Effects	Agricultural Land Stewardship (#2) Floodplain Management (#10) Urban Land Use Management (#20) Urban Runoff Management (#21) Watershed Management and Planning (#25)	● ^{1,2}	○ ²	○ ²	○	○	●	●	●	●
Reduce Pollutants and Stressors	Agricultural Land Stewardship (#2) Pollution Prevention (#13) Urban Runoff Management (#21) Watershed Management and Planning (#25)	● ^{1,2}	○ ²	○ ²	○	○	●	●	●	●
Restore and Preserve Habitat and Open Space	Agricultural Land Stewardship (#2) Ecosystem Restoration (#9) Urban Land Use Management (#20) Watershed Management and Planning (#25)	● ^{1,2}	○ ²	○ ²	○	○	●	●	●	●
Optimize Water-Based Recreation	Ecosystem Restoration (#9) Pollution Prevention (#13) Urban Runoff Management (#21) Water-Based Rec. and Public Access (#25)	● ^{1,2}	○ ²	○ ²	○	○	●	●	●	●

1 Action plans (see Section G) are proposed to address how to best achieve community involvement, data management, technical/scientific objectives.

2 The Region's IRWM institutional structure will select prioritization criteria on which to rank (for purposes of soliciting funding) the projects within the respective integrated groups. Maximizing stakeholder input (Objective A), managing water resources data (Objective B) and furthering scientific and technical understanding (Objective C) are among the key criteria that can be used by the organization in prioritizing funding for IRWM projects.

- Integrated group of water management strategies directly achieve the IRWM Plan objective
- Integrated group of water management strategies indirectly help to achieve the IRWM Plan objective

Additional Benefits of Strategy Integration. As described in Appendix 6, in addition to supporting Plan objectives, integration of the water management strategies may provide additional benefits, including:

- avoiding duplication of planning, implementation, design, compliance, or implementation efforts,
- identifying and resolving jurisdictional, legal, administrative, or water rights issues among implementing agencies,
- providing a unified approach for identifying, collaborating, and more efficiently addressing regulatory challenges,
- more efficiently addressing environmental challenges,
- enhancing efficiency of monitoring (e.g. combining monitoring efforts and reducing monitoring duplication) and data management,
- resolving potentially conflicting water management needs,
- allowing for overall cost reduction through sharing facilities, economy of scale, or eliminating duplicative planning, implementation, design, or compliance efforts,
- allowing for cost sharing among organizations,
- increasing public awareness, public education, and stakeholder involvement, and
- providing synergistic effects to optimize attainment of IRWM Plan objectives.

Table E-3 (page E-18) summarizes additional benefits provided by the six integrated strategy groups.

Implementation of Objectives A, B, and C. The six integrated strategy groups are developed specifically to support Objectives D through I. In conjunction with proposed action plans (see Section G)), the integrated groups also help achieve the overarching Plan Objectives A, B, and C . Within Section G, action plans are presented to develop stakeholder involvement programs to support Objective A, a data management program to support Objective B, and a scientific/technical program to support Objective C. An action program is also proposed to select priority projects for implementation. As part of these programs, priority projects can be evaluated and selected to optimize attainment of overarching Plan Objectives A, B, and C.

**Table E-3
Benefits Achieved by Integrating Water Management Strategies**

Purpose of Integrated Strategy Group	Primary Water Management Strategies within the Integrated Group	Potential Benefits of Integrating Water Management Strategies							
		Avoid Duplication of Effort	Resolve Jurisdictional, Legal, Admin., or Water Rights Issues	More Efficiently Address Regulatory Challenges	More Efficiently Address Environmental Challenges	Enhance Monitoring Efficiency or Data Management	Resolve Potentially Conflicting Management Needs	Cost Savings Opportunities	Cost Sharing Opportunities
Diverse Mix of Water Resources	Agricultural Water Use Efficiency (#3) Groundwater Management (#4) Seawater Desalination (#6) Groundwater Aquifer Remediation (#11) Recycled Water (#16) Urban Water Use Efficiency (#22) Water Transfers (#23)	●	●	○	●	○	●	●	○
Reliable Water Infrastructure	Conveyance (#5) Potable Water Treatment and Distrib. (#7) Regional Surface Storage (#18) Reoperation and Reservoir Mgt. (#19)	●	●	○	●	○	●	●	○
Reduce Negative Hydromodification and Flooding Effects	Agricultural Land Stewardship (#2) Floodplain Management (#10) Urban Land Use Management (#20) Urban Runoff Management (#21) Watershed Management and Planning (#25)	●	●	●	●	●	●	●	●
Reduce Pollutants and Stressors	Agricultural Land Stewardship (#2) Pollution Prevention (#13) Urban Runoff Management (#21) Watershed Management and Planning (#25)	●	●	●	●	●	●	●	●
Restore and Preserve Habitat and Open Space	Agricultural Land Stewardship (#2) Ecosystem Restoration (#9) Urban Land Use Management (#20) Watershed Management and Planning (#25)	●	●	●	○	○	●	●	●
Optimize Water-Based Recreation	Ecosystem Restoration (#9) Pollution Prevention (#13) Urban Runoff Management (#21) Water-Based Rec. and Public Access (#25)	●	●	●	○	○	●	●	●

- Integrated group of water management strategies may directly achieve the listed benefit
- Integrated group of water management strategies indirectly help to achieve the listed benefit

Application of Integrated Strategies within Plan. The above integration exercise indicates how the selected water management strategies may be combined to optimize attainment of Plan objectives and provide other benefits.

As indicated in Section D and Appendix 5, more than 160 candidate water management projects have been solicited for consideration within this IRWM Plan. A two-stage process will be used to prioritize the Region's water management projects. Initial prioritization is presented within Section F, in which a list of Tier I water management projects is developed. A subsequent stage will involve funding prioritization among the Tier I projects. This subsequent stage will occur in future months with the implementation of action plans presented in Section G. Integration will represent an important consideration within each of these two prioritization stages.

Importance of Multiple Water Management Strategies in Selecting Tier I Project List. The integrated strategy groups (see Table E-2 on E-16) emphasize the importance of multiple water management strategies to achieve the range of IRWM Plan objectives. A myriad of interrelations exist (see Table E-1 on page E-8) among the selected water management strategies. These interrelations allow a given water management project to support a range of IRWM Plan objectives if (1) the project addresses multiple water management strategies, and (2) the project is appropriately combined with other strategies. Agricultural and urban water use efficiency, for example, help to optimize water supply (through demand reduction) when linked with water supply strategies. Agricultural and urban water use efficiency also help to optimize water quality protection (through runoff reduction) when combined with pollution control strategies.

Recognizing that implementing multiple water management strategies offers the potential for increased integration benefits, the initial prioritization process presented in Section F utilizes the number of water management strategies each project implements as one of several criteria for developing a list of Tier I water management projects.

Selection of Priority Projects. Further programs and short-term priorities (see Section G) will develop the process and criteria for prioritizing funding for the Tier I projects. How each project fits within the above-developed integrated groups to achieve the Plan objectives is one criterion the RWMG and RAC could consider in addressing funding priorities for the Tier I projects.

Section E References

California Department of Water Resources (DWR) and State Water Resources Control Board (State Board). *Integrated Regional Water Management Grant Program Guidelines*. 2004.

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