



Adaptive Management



ESSA

35
YEARS

ESSA Technologies Ltd.

2695 Granville Street, Suite 600
Vancouver, BC, V6H 3H4

P: (604) 733-2996

F : (604) 733-4657

E : dmarmorek@essa.com; cmurray@essa.com

www.essa.com

300-411 Roosevelt Avenue
Ottawa, ON, K2A 3X9

P: (613) 798-1300

F: (613) 798-5331

E: international@essa.com



About Us

Since 1979, ESSA Technologies Ltd. (ESSA) has been committed to **bringing together people, science and analytical tools to sustain healthy ecosystems and human communities.**

ESSA is a 100% Canadian-owned company that works collaboratively with governments, non-government and private sector clients. We have completed over 2200 projects in over 40 countries throughout North and South America, Africa, Asia, and the Caribbean. The key to our success is a unique and rich combination of scientific expertise, advanced tools for systems analysis, facilitation techniques that integrate over disciplines, an emphasis on creativity, innovation and critical thinking, and proven approaches for dealing with uncertainty, which together provide leading-edge services for our clients.

Our work is guided by three core values:

- Scientific Rigour: we build our work on a solid foundation of good hard science.
- Passion & Innovation: we are driven to explore and pioneer solutions for a sustainable world.
- Wicked Problems: we welcome really tough, leading-edge challenges.

Our Main Service Areas

ESSA's business activities are focused on four main areas:

- **Aquatic species at risk and water resource management**
- **Environmental, social, and cumulative effects assessment**
- **Climate change adaptation and disaster risk reduction**
- **Terrestrial ecology and forest resource management**

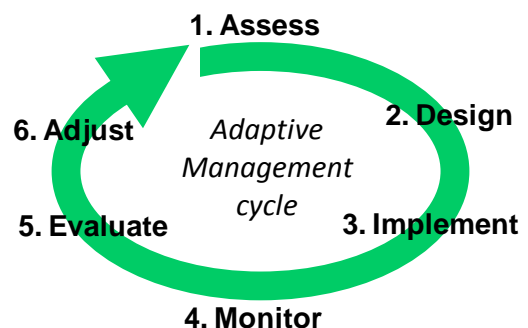
The synergy between these disciplines is a key component of the reputation of ESSA's professionals and our longevity in a highly competitive business.

Adaptive management has been a cornerstone of ESSA's environmental consulting approach for the past 35 years. Since our inception we have been helping clients implement various aspects of adaptive management to solve resource management problems.

The following sections provide an overview of our services, experience and expertise in adaptive management.

About Adaptive Management (AM)

Adaptive Management is systematic, practical approach to improving resource management policies and practices. It provides a structured process for learning which management actions best meet management objectives, and for reducing the most important management uncertainties. In its most effective form, operational treatments are used to test clearly formulated hypotheses about important but uncertain ecological responses to management actions.



There is wide-spread misunderstanding about adaptive management, and much misuse of the concept. **Our approach** to AM is scientific, rigorous and disciplined. We use quantitative tools and methods to strategically target learning that will best inform and improve policies and practices towards achieving your environmental management goals.

Our AM Services

If you are involved in environmental or natural resource management, ecosystem restoration, or environmental impact mitigation, or if you



are regulating any of these activities, then you may find tremendous benefit from learning more about adaptive management, and how it can be applied.

- Are you having difficulty deciding how best to achieve management or restoration objectives? Or deciding among alternative management actions?
- Do stakeholders disagree about which are the most effective management actions for achieving stated objectives?
- Are you uncertain about the environmental outcomes of some of your management practices, ecological restoration activities, facility operations, or mitigations?
- If you are a regulator, are you faced with making decisions despite uncertainty about the environmental outcomes? Are you unsure about what conditions to place on certificates, licenses or permits?

If you answered “yes” to any of these questions, then adaptive management can help. It should be part of any toolbox used by managers, regulators and stakeholders to resolve difficult problems.

ESSA offers a range of adaptive management consulting services, including:

- Expert advice on adaptive management at all stages in the AM cycle
- Independent review of AM plans
- Developing and implementing AM plans
- Quantitative decision analysis of alternative management actions
- Screening uncertainties to identify the most critical questions
- Translating these questions into testable hypotheses
- Detailed spatial monitoring design
- Design of data analysis and evaluation approaches
- Workshops with managers, scientists and stakeholders throughout the AM cycle
- Awareness-raising and tailored training sessions on AM best-practice
- AM policy guidance

These services are all delivered with a sustained focus on the information needs of decision-makers.



Selected AM Experience

ESSA has undertaken adaptive management projects throughout North America, including Ontario, British Columbia, Alberta, Nebraska, Washington, Florida, Arizona, New Mexico, Louisiana, and California. The following lists convey a sampling of some of our adaptive management projects.

Adaptive management plans, for:

- Managing emissions from an industrial facility in northern British Columbia
- Species recovery while also meeting multiple water use needs in New Mexico’s Middle Rio Grande
- Habitat restoration in Dry Creek and the Trinity River, California

Adaptive management expert advice, for:

- Platte River Recovery Implementation Program
- Comprehensive Everglades Restoration Program



- Puget Sound Nearshore Ecosystem Restoration Program
- National Commission on Science for Sustainable Forestry
- Evaluating the effectiveness of British Columbia's Watershed Restoration Program
- Restoration planning in California's San Joaquin River
- Land protection and restoration on the Gulf Coast of Louisiana



- Management of sea lamprey in the Great Lakes
- Watershed restoration in Mexico and British Columbia
- Landscape unit planning in British Columbia
- Monitoring effectiveness of reclamation guidelines in the Alberta Oil Sands
- Managing alien invasive species in endangered ecosystems in south-western British Columbia
- Salmon conservation in the Pacific Northwest
- Restoring ponderosa pine ecosystems in the southwestern USA while minimizing the threat of catastrophic fire

Tools for implementing AM:

- Leading a multi-agency project and building quantitative tools to improve the monitoring and evaluation of hydro, habitat, hatchery and harvest actions in the Columbia Basin

- Facilitating a multi-agency effort to re-introduce sockeye to Skaha Lake, and to evaluate the effects of this very successful AM experiment
- Developing a model for adaptive in-season management of water releases from Okanagan Lake using real-time information
- Developing monitoring designs, assessment plans and quantitative tools to assist the Trinity River Restoration Program in their long term adaptive management program to recover fish and wildlife
- Decision analysis to evaluate alternative actions for maintaining fish populations and power production at Keenleyside Dam, Canadian Columbia River
- Leading the evaluation of alternative recovery measures for endangered Columbia River salmon stocks, including dam removal, fish transport and adaptive management actions to improve habitat

Selected AM Conference Presentations

- *What it really takes to test hypotheses concerning ecosystem restoration and species recovery.* Presented by D. Marmorek at the 2014 Conference on Ecological and Ecosystem Restoration in New Orleans, Louisiana.
- *Putting the M&E back into Adaptive Management.* Introductory presentation by D. Marmorek at a symposium he organized and chaired on *Rigorous Adaptive Management for Approaches to Benefit Fish Populations and Aquatic Ecosystems*, as part of the 2011 American Fisheries Society conference in Seattle, Washington.
- *What determines whether or not adaptive management programs affect management and policy decisions?* Presented by D. Marmorek in 2011 at the 4th National Conference on Ecosystem Restoration in Baltimore, Maryland.
- *True versus Pretend Adaptive Management.* Presented by D. Marmorek in 2007 at the 2nd National Conference on Ecosystem Restoration in Kansas City, Missouri.
- *Integration – the holy grail of Columbia Basin monitoring and evaluation. Challenges, examples and lessons learned from the*



Collaborative Systemwide Monitoring and Evaluation Project. Presented in 2008 by D. Marmorek at the American Fisheries Society Western Division Meeting, Portland, Oregon.

- *Adaptive Management: A Spoonful of Rigour Helps the Uncertainty Go Down*. Presented in 2004 by C. Murray at the 16th International Annual Meeting of the Society for Ecological Restoration in Victoria, British Columbia.
- *Adaptive Management: A Science-Based Approach to Managing Ecosystems in the Face of Uncertainty*. Presented in 2003 by C. Murray at the 5th International Conference on Science and Management of Protected Areas: Making Ecosystem Based Management Work, in Victoria, BC.

Selected AM Publications

- Murray, C.L., D. Marmorek and L. Greig. (in press.) *Adaptive Management Today: A Practitioners' Perspective*. Chapter 10, in: *Adaptive Management of Social-Ecological Systems*. Allen, C., A. Garmestani and C. Smith (Eds.). Springer.
- Greig, L. A., D. R. Marmorek, C. Murray and D. C. E. Robinson. 2013. [Insight into Enabling Adaptive Management](#). *Ecology and Society* 18 (3): 24 [online].
- Murray, C., C. Smith and D. Marmorek. 2011. *Middle Rio Grande Endangered Species Collaborative Program Adaptive Management Plan Version 1*. Prepared by ESSA (Vancouver, BC) and Headwaters Corporation (Kearney, NE) for the Middle Rio Grande Endangered Species Collaborative Program, Albuquerque, New Mexico.
- Greig, L, D. Marmorek and C. Murray. 2008. *Guideline for Preparation of Adaptive Management Plans*. Prepared by ESSA Technologies Ltd., Richmond Hill, ON for Fisheries and Oceans Canada, Yellowknife, Northwest Territories.
- Alexander, C.A.D., C.N. Peters, D.R. Marmorek and P. Higgins. 2006. *A decision analysis of flow management experiments for Columbia River mountain whitefish management*. *Can. J. Fish. Aquat. Sci.* 63: 1142-1156.
- Murray, C. and D. Marmorek. 2003. *Adaptive Management and Ecological Restoration*. Chapter 24, in: Freiderici, P. (ed.). 2003. *Ecological Restoration of Southwestern Ponderosa Pine Forests*. Island Press (Washington, Covelo CA, London).
- Jones, M. and L. Greig. 1985. *Adaptive*

Environmental Assessment and Management: A New Approach to Environmental Impact Assessment. Pages 21-42, in: V.W. MacLaren and J.B. Whitney (eds.) *New Directions in EIA in Canada*. Methuen Publications, Toronto, Ontario.



Contacts

ESSA has a team of seasoned systems ecologists and quantitative analysts experienced in adaptive management, led by David Marmorek, Carol Murray and Lorne Greig. These three senior partners have each been with ESSA for more than 25 years, and have been implementing adaptive management approaches throughout their careers. They have a proven track record of helping clients understand how adaptive management can be a valuable approach to addressing uncertainty in decision-making, and how to move forward in a manner that explicitly addresses key uncertainties in complex, multi-objective situations. They have developed AM plans in a range of contexts, have served as invited panel members on international conferences, and have co-authored numerous papers and two book chapters on adaptive management.

[David R. Marmorek](#)

President

1.604.733.2996 (British Columbia)

dmarmorek@essa.com

[Carol L. Murray](#)

Managing Partner

1.250.230.2020 (British Columbia)

cmurray@essa.com

[Lorne A. Greig](#)

Emeritus Environmental Scientist, and Principal

1.905.770.6334 (Ontario)

lgreig@essa.com

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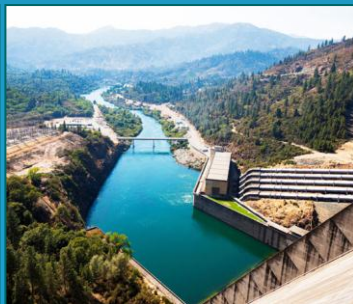
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YEARS



*Environmental & Cumulative
Effects Assessment*



*Climate Change Adaptation &
Disaster Risk Reduction*



*Aquatic Species at Risk &
Water Resource Management*



*Terrestrial Ecology &
Forest Resource Management*