

WVLC INTEGRATED WATER RESOURCES MANAGEMENT PROGRAMME

Draft Programme Outline

1. An Introduction to IWRM
2. Water Transfer
3. The Terrestrial Ecosystem and The Impacts of Land Use Changes
4. The Aquatic Ecosystem
5. Aquatic Ecosystem Health and Impact Assessment
6. Water Use
7. Wastewater
8. Governance and Community Based Approaches
9. Organizational Infrastructure and Management
10. Applying Integrated Water Resources Management

The contents of each course module will relate back to the concept(s) of IWRM. Comprehensive reinforcement of concepts and principles is provided through Course #10 (a tutorial course) where IWRM is applied to case studies and real data. The integration of material in the rest of the programme will be facilitated by constantly referring to a set of theme topics that apply to many different aspects of the courses. In addition, where solutions to water-based problems are discussed, a range of options and a method to evaluate the most suitable option will be provided.

AN INTRODUCTION TO IWRM - Course #1

Name of the Document	Path and details
Ecological Principles for Managing Land Use: The ecological Society of America's Committee on Land Use	Total pages 16 S:\Common\WVLCTrain\Landuse\ECOLOGICAL PRINCIPLES FOR MANAGING LAND USE.doc
Proceedings of the Ontario Workshop on Riverine Science Requirements	Total pages 30 S:\Common\WVLCTrain\Landuse\RiverineSciWkshpRep.pdf
Integrated Water Resources Management	Total pages 71 s:\Common\WVLCTrain\GWP\GWP_IWRM_Tacno4.pdf
Protecting and Restoring America's Watersheds: Status! Trends! and Initiatives in Watershed Management	Total pages 56 s:\common\WVLCTrain\USEPA\USEPA_Watersheds_restore725.pdf

WATER TRANSFER -- Course #2

Module 1.0 Water and the Atmosphere

1. The Natural Water Cycle: Introductory Lecture, describe components of the cycle, interfaces, interactions, seasonality, long-term changes, measurement points, states and ecological significance.
2. Weather and Climate: Definitions, terms, measures, scales, changes and effects.
3. Water: States and processes, evaporation, condensation, purification/contamination.
4. Precipitation: Processes and causes, seasonality, long-term cycles and directional change, measurement.

Module 2.0 Water and Land

5. The Land Interface: Interception, runoff and surface effects, surface impacts and changes, porous and non-porous media
6. Infiltration: Infiltration, flow through porous media, soil moisture, soil type, antecedent conditions and change.
7. Evaporative Return: Energy, evaporation, evapotranspiration,
8. Surface Runoff 1: General terms and definitions, catchment, basin, watershed, basic hydrograph, channels, streams, rivers, measurement, temporal change, soil loss,
9. Surface Runoff 2: Peak flow, storm events, flooding, flood flow, surface impacts,

Module 3.0 Water and the Riparian Environment

10. Rivers 1: Introduction, basic behaviour, thermal and physical properties
11. Rivers 2: hydrograph, flow measurement,
12. Rivers 3: peak flows, flood conditions, modelling
13. Sediment Transport: Soil loss, sheet erosion, channel transport,

Module 4.0 Water and Lakes

14. Lakes 1: General formation and structure
15. Lakes 2: Water balance, storage,

16. Lakes 3: Hydromechanics, water levels,

17. Lakes 4: Thermal properties,

Module 5.0 Groundwater

18. Groundwater 1: Introduction to basics and terms, occurrence

19. Groundwater 2: Aquifers, geology, water movement

20. Groundwater 3: Hydrologic mapping, exploration (assessment)

21. Groundwater 4: Inventories, modelling

Module 6.0 Watersheds

22 Basin Yield: Water balance, temporal change

23. Water Budget: Construction, modelling, prediction

24. Droughts and Floods: States, conditions, long and short-term effects and changes

25. Climate Change: Introduction, terms, processes, change and effects on water cycle,

PLUS TUTORIAL EXERCISES

Name of document	Source and path
Chapter 7 – Introduction to Metrology and Climatology	http://www.geog.ouc.bc.ca/physgeog/contents/chapter7.html mpidwirny@okanagan.bc.ca v. Climate classification and climatic regions of the world Path Courses\Course2\7(v) Climate Classification and Climatic Regions of the World w. Introduction to Applied Climatology Courses\Course2\7(w) Introduction to Applied Climatology z. El Nino, La Nina and the Southern Oscillation Courses\Course2\7(z) El Nino, La Nina and the Southern Oscillation Also, Path s:\Common\Courses\Course 2\Pidwirny_PhysGeog_Chapter 7.doc
Chapter 8 – Introduction to Hydrology	http://www.geog.ouc.bc.ca/physgeog/conten

	<p>nts/chapter8.html</p> <p>b. The Hydrological Cycle</p> <p>g. Global Distribution of Precipitation</p> <p>i. Evaporation and Transpiration</p> <p>j. Actual and Potential Evapotranspiration</p> <p>k. Interception, Stemflow, Canopy Drip and Throughfall</p> <p>l. Infiltration and Soil Water Storage</p> <p>m. Throughflow and Groundwater Storage</p> <p>n. Introduction to Surface Runoff</p> <p>Path s:\Common\Courses\Course 2\Pidwirny_PhysGeog_Chapter 8.doc</p>
<p>Groundwater Education Materials University of Minnesota, Sea Grant Minnesota</p>	<p>1. Groundwater Glossary</p> <p>2. Fun Questions Related to Groundwater</p> <p>3. Groundwater A Source of Wonder – Drinking water from Wells (American Ground Water Trust – Consumer Awareness Information Pamphlet #12)</p> <p>4. What is Ground Water – Ground water basics like where groundwater comes from, the saturated zone, water table, unsaturated zone, permeability, porosity, aquifers, recharge, confined or artesian aquifer, unconfined or water table aquifer, losing streams, wells: cone of depression.</p> <p>path wvlc\cdcontents\cd1 (1364)</p>
<p>Water Budget Analysis on a Watershed Basis: The Watershed Management Committee</p>	<p>path wvlc\cdcontents\cd5 (1368)</p>

THE TERRESTRIAL ECOSYSTEM AND THE IMPACTS OF LAND USE CHANGES -- COURSE #3

Module 1.0 The Basin

1. Introduction: Review of Water Cycle and land interactions, definitions, and concepts
2. Physical Systems 1: Geology, geomorphology, geochemistry, active systems, stable systems
3. Physical Systems 2: Vegetation, biogeography, natural/baseline conditions, water storage and, water cycle changes.

Module 2.0 The Terrestrial Ecosystem

4. Terrestrial Ecology 1: Introduction, basic concepts, structures of ecosystems (biotic and abiotic)
5. Terrestrial Ecology 2: Ecosystems and how they work, organization and energy landscape ecology
6. Terrestrial Ecology 3: Ecosystem function, nutrient cycling, energy flow, biomass
7. Terrestrial Ecology 4: Density dependent/independent factors, predator-prey, host-parasite, habitats, niche, competition
8. Terrestrial Ecology 5: Natural change, evolution, stability, biodiversity
9. Terrestrial Ecology 6: Anthropogenically driven change – direct and indirect, effects, human impacts
10. Wetlands:

Module 3.0 Land Use Impacts

11. Forestry:
12. Agriculture:
13. Mining:
14. Dams and Diversions:
15. Urbanization:
16. Transportation Development:

Module 4.0 Watershed Planning and Analysis

17. Watershed Concept:

18. Watershed Analysis:

19. GIS 1: An Introduction, mapping and information content

20. GIS 2: GIS application and the water budget water balance

21. IWM/Planning:

Module 5.0 Conservation and Planning

22. Controlling Water Loss/Erosion:

23. Land Conservation:

24. Large Urban Development: Development, sprawl, redevelopment

25. LUC Planning and Economics:

PLUS TUTORIAL EXERCISES

Name of document	Source and path
Water Budget Analysis on a Watershed Basis: The Watershed Management Committee	2.5 Impact of Land Use Changes on Water Budget 2.5.1 Forestry 2.5.2 Agricultural Changes 2.5.3 Urbanization 2.5.4 Wetland Changes 2.5.5 Other Development (Industry, Hydropower, Mining Activities, Water Taking, Municipal Water Use) 2.6 Other Human Interactions path wvl\cdcontents\cd5 (1368) Cumming Cockburn Limited
World Meteorological Organization: Guide to Hydrological Practices	Chapter 47 – Introduction to Applications for Water Management 47.1 General 47.2 Purposes to be served by a water management project 47.3 Multi-purpose projects 47.4 water-resource systems 47.5 Preliminary investigation of water-management projects Chapter 48 – Sustainable Water Development

	<p>48.1 General</p> <p>48.2 The changing nature of the resource</p> <p>48.2.1 Natural Changes</p> <p>48.2.2 Man Induced Changes</p> <p>48.3 Changing attitudes to management</p> <p>48.4 Water-data programmes</p> <p>path wvlc\cdcontents\cd14 (1377)</p>
<p>Projecting Land-use Change: A Summary of Models for Assessing the Effects of Community Growth and Change on Land-Use Patterns</p>	<p>Pages 271</p> <p>Abstract</p> <p>Many potential clients for land-use change models, such as city and county planners, community groups, and environmental agencies, need better information on the features, strengths, and limitations of various model packages. Because of this growing need, the U.S. Environmental Protection Agency (EPA) has developed a selective summary of 22 leading landuse change models currently in use or under development. Partners in scoping this effort include the U.S. Departments of Transportation and Interior, the academic and consulting communities, and multiple program and regional offices across EPA. EPA's Office of Research and Development (ORD) initiated the land-use change models summary in order to improve its ability to assess and mitigate future risk to ecological systems, human health, and quality of life. Target user groups for this publication are:</p> <ul style="list-style-type: none"> • Community planners, citizens, and decision makers who are seeking tools to analyze future land-use scenarios; • EPA program office and regional staff who support communities with planning tools and information for sustainable development; and • ORD modelers and research planners who are currently assessing land-use models and gaps in the state of the science. <p>Path: S:\common\WVLCTrain\USEPA\land use change.pdf</p> <p>Path: s:\common\courses\course3\land use change.pdf</p>
<p>The Health of Our Water – Toward Sustainable agriculture in Canada</p>	<p>Path</p> <p>S:\common\wvlc\train\agriculture\AAFC_water.pdf</p> <p>Also</p> <p>s:\common\courses\course3\ AAFC_water.pdf</p>
<p>Eight Tools of Watershed Protection</p>	

in Developing Areas – USEPA Center for Watershed Protection	
Sustainable Lakes Planning Workbook: A Lake Management Model (Minnesota Shoreland Management – Resource Guide)	Appendix E: Land Use Impacts on Water Quality Path wvlc\cdbox\cd 4 (1367) wvlc\cdcontents\cd4
Biology 2F03 – Fundamental and Applied Ecology (Student Handbook and CD), Dr Patricia Chow-Fraser	Module 1 – Organisms and their habitat in a forested ecosystem Module 2 – Physical and chemical environment that defines wetland ecosystem Module3 – Diversity of biological organisms in food webs Module 4 – Model population growth and construct lie tables Module 5 – Diversity indices, ecological succession and ecological footprints Module 6 – Apply ecological principles to solve environmental problems Path wvlc\cdbox\cd 15 (1378)
Introductory Ecology Course Notes Lynda D. Corkum – University of Windsor	Path wvlc\cdbox\cd 28 & 29 (1392 & 1393)
Fundamentals of Physical Geography - Michael J. Pidwirny	Path S:\Common\CurriculumRawMaterial\OUC also www.geog.ouc.bc.ca/physgeog/contents/table.html Preface Chapter 1: Introduction to Physical Geography (a). Introduction to Geography (b). Elements of Geography (c). Scope of Physical Geography (d). Geography as an Environmental Science (e). History of Physical Geography (f). Future of Physical Geography path s:\common\courses\course3\Pidwirny_PhysGeo_g_Chapter 1.doc 1-A Chapter 2: Maps, Remote Sensing, and GIS (d). Topographic Maps (e). Introduction to Remote Sensing (f). Introduction to Geopgraphic Information Systems path s:\common\courses\course3\Pidwirny_PhysGeo_g_Chapter 2.doc Module 4 B Chapter 3: The Science of Physical Geography

	<p>Chapter 4: Introduction to Systems Theory</p> <ul style="list-style-type: none"> (b). Definitions of Systems and Models (c). Structure of Systems (d). Environmental Systems as Energy Systems (e). Food Chain as an Example of a System (f). Equilibrium Concepts and Feedbacks <p>path s:\common\courses\course3\Pidwirny_PhysGeog_Chapter 4.doc</p> <p>Chapter 5: The Universe, Earth, Natural Spheres, and Gaia</p> <p>Chapter 6: Energy and Matter</p> <p>Chapter 7: Introduction to Meteorology and Climatology</p> <ul style="list-style-type: none"> (v). Climate Classification and Climatic Regions of the World (w). Introduction to Applied Climatology (y). Causes of Climate Change (z). El Nino, La Nina and the Southern Oscillation <p>Chapter 8: Introduction to Hydrology</p> <ul style="list-style-type: none"> (b). The Hydrologic Cycle (c). Atmospheric Humidity (d). Condensation, Freezing and Deposition (e). Cloud Formation Processes (f). Precipitation and Fog (g). Global Distribution of Precipitation (i). Evaporation and Transpiration (j). Actual and Potential Evapotranspiration (k). Interception, Stemflow, Canopy Drip, and Throughfall (l). Infiltration and Soil Water Storage (m). Throughflow and Groundwater Storage (n). Introduction to Surface Runoff <p>path s:\common\courses\course3\Pidwirny_PhysGeog_Chapter 8.doc</p> <p>Chapter 9: Introduction to Biogeography and Ecology</p> <ul style="list-style-type: none"> (d). Organization of Life: Species, Populations, Communities, and Ecosystems (e). Abiotic Factors and the Distribution of Species (f). Biotic Interactions and the Distribution of Species (g). Concept of Ecological Niche (h). Species Diversity and Biodiversity (i). Plant Succession
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	<p>(j). Introduction to the Ecosystem Concept (k). Characteristics of the Earth's Terrestrial Biomes (l). Primary Productivity of Plants (m). Production by Consumers and the Grazing Food Chain (n). Organic Decomposition and the Detritus Food Chain (o). Trophic Pyramids and Food Webs (p). Biogeochemical Cycling: Inputs and Outputs of Nutrients to Ecosystems (q). Soil Organic Matter Decomposition and Nutrient Cycling (r). The Carbon Cycle (s). The Nitrogen Cycle</p> <p>path s:\commom\courses\course3\Pidwirny_PhysGeo_g_Chapter 9.doc 1-C Module 2</p> <p>Chapter 10: Introduction to Geology (o). Physiography of the Earth's Terrestrial Surface</p> <p>path s:\commom\courses\course3\Pidwirny_PhysGeo_g_Chapter 10.doc 1-J, Module 1</p> <p>Chapter 11: Introduction to Geomorphology (a). Models of Landform Development (b). Weathering (c). Landforms of Weathering (d). Introduction to Soils (e). Soil Pedogenesis (f). Soil Classification (g). Erosion and Deposition (h). Hillslope Processes and Mass Movement (i). Streamflow and Fluvial Processes (j). Fluvial Landforms (k).The Drainage Basin Concept (l). Stream Morphometry (m). Coastal and Marine Processes and Landforms (r). Eolian Processes and Landforms</p> <p>path s:\commom\courses\course3\Pidwirny_PhysGeo_g_Chapter 11.doc 1-K Module 1</p>
<p>Fundamentals of Physical Geography – Online Study Guide.</p>	<p>Path S:\Common\CurriculumRawMaterial\OUC</p> <p>This study guide contains summary of materials covered under each section in the main course material, key terms, questions, problems, exercises and additional library readings.</p>

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| | <ol style="list-style-type: none">1). Introduction to Physical Geography2). Maps, Remote Sensing, and GIS3). The Science of Physical Geography4). Introduction to Systems Theory5). The Universe, Earth, Natural Spheres, and Gaia6). Energy and Matter7). Introduction to Meteorology and Climatology8). Introduction to Hydrology9). Introduction to Biogeography and Ecology10). Introduction to Geology11). Introduction to Geomorphology <p>Path S:\Common\Courses\Course 3\On Line Study Guide</p> |
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<p>Geography 210 Introduction to Environmental Issues - Michael J. Pidwirny</p>	<p>Path S:\Common\CurriculumRawMaterial\OUC\ Pinwirny_Geog 210_Contents Path S:\Common\Courses\Course 3\Environmental Issues</p> <ol style="list-style-type: none"> 1. Introduction to Environmental Studies <ul style="list-style-type: none"> · 1.1 State of the Planet: Introduction to Environmental Issues · 1.2 Resources and the Environment · 1.3 History of Resource Use, Technology, and Development · 1.4 Conservation and Resource Management · 1.5 Attitudes Toward the Environment · 1.6 Science and the Environment · 1.7 Environmental Futures and Sustainable Development 2. Matter, Energy, and Ecology <ul style="list-style-type: none"> · 2.1 Building Blocks of Life · 2.2 Energy and Matter · 2.3 Photosynthesis and Respiration · 2.4 Structure of Life: Species, Populations, Communities, and Ecosystems · 2.5 Energy Flow in Ecosystems · 2.6 Ecosystem Productivity · 2.7 Biogeochemical Cycling · 2.8 Abiotic Factors Influencing the Distribution of Species · 2.9 Biotic Interactions · 2.10 Community Properties · 2.11 Terrestrial Biomes · 2.12 Aquatic Ecosystems · 2.13 Disturbance and Restoration 3. Population Dynamics <ul style="list-style-type: none"> · 3.1 Mathematical Dynamics of Population Growth · 3.2 Factors that Influence Population Size · 3.3 Regulation of Population Growth · 3.4 Human Population History and Future · 3.5 Demography of Humans · 3.6 The Demographic Transition · 3.7 Controlling Human Population Growth 4. Food, Soils, and Agriculture <ul style="list-style-type: none"> · 4.1 Human Nutritional Needs · 4.2 Types of Agriculture
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THE AQUATIC ECOSYSTEM – Course #4

Module 1.0 An Introduction to the Aquatic Ecosystem

1. Introduction: Water cycle and aquatic ecosystems (AEs) – rivers, lakes, estuaries, wetlands
2. Aquatic Ecosystems: Land – water interfaces and interdependencies, wetlands, groundwater
3. AEs VS TEs: The aquatic environment and its ecosystems compared and contrasted with terrestrial ecosystems

Module 2.0 The Riparian Ecosystem

4. Rivers 1: Physical/chemical environment
5. Rivers 2: Biological systems – Part 1
6. Rivers 3: Biological systems – Part 2
7. Rivers 4: Ecological processes – primary production, decomposition, nutrient cycling
8. Rivers 5: Food webs and energy flow, biomass
9. Rivers 6: Habitat, ecological requirements, tolerances, dependencies
10. Streams: Streams versus rivers

Module 3.0 The Lacustrine Ecosystem

11. Lakes 1: Physical/chemical environment
12. Lakes 2: Biological systems – Part 1
13. Lakes 3: Biological systems – Part 2
14. Lakes 4: Ecological processes – primary production, decomposition, nutrient cycling
15. Lakes 5: Food webs and energy flow, biomass
16. Lakes 6: Sediments – physics, chemistry, benthic pelagic coupling, long and short-term storage
17. Lakes 7: Habitat, ecological requirements, tolerances, dependencies

18. Reservoirs: Reservoirs versus lakes
- Module 4.0 Wetlands and Estuaries
19. Wetlands 1: Chemistry and chemical processes
20. Wetlands 2: Organisms and ecological processes
21. Estuaries 1: General description and physical processes
22. Estuaries 2: Chemical processes
23. Estuaries 3: Biological systems and ecological processes
- Module 5.0 Groundwater
24. Groundwater 1: Chemistry and chemical processes
25. Groundwater 2: Biology and biologically mediated processes

PLUS TUTORIAL EXERCISES

Name of document	Source and path
Groundwater mapping and assessment in British Columbia – Vol II – Criteria and Guidelines	FRAP site – file # on FRAP CD1 9334.pdf
Groundwater mapping and assessment in British Columbia – Vol I – Review and Recommendations	FRAP site – file # on FRAP CD1 9333.pdf
Minnesota Shoreland Management Resource Guide – Some of can go in course2	1. Overview from Lake Ecology and Overview (Chapter 1, Horne, A.J. abd C.R. Goldman, 1994. Limnology 2 nd edition) e:\MNSMRG\depth\limnology\index.html 2. Light e:\MNSMRG\depth\limnology\page4.html 3. Density Stratification e:\MNSMRG\depth\limnology\page5.html 4. The Watershed e:\MNSMRG\depth\limnology\page6.html 5. Dissolved Oxygen e:\MNSMRG\depth\limnology\ 6. Lake Zones e:\MNSMRG\depth\limnology\ 7. The Food Web e:\MNSMRG\depth\limnology\

	8. Eutrophication e:\MNSMRG\depth\limnology\ <u>www.shorelandmanagement.org path – wvlc/cdcontents/cd4 (1367)</u>
Minnesota Shoreland Management Resource Guide – Some of can go in course2	<u>www.shorelandmanagement.org path – wvlc/cdcontents/cd4 (1367)</u> 1. Minnesota Rivers, A Primer – University of Minnesota e:\MNSMRG\depth\rivers\ 2. River system functions: A river Science Primer 3. Moving Along the Stream Corridor: A Longitudinal View 4. Key Stream Processes and other important system characteristics 5. Geomorphic Processes 6. Physical and Chemical Processes 7. Biological Community 8. Self-Correcting Mechanisms and Dynamic Equilibrium 9. Stream Water Uses 10. Instream Users
Methods for Evaluating Wetland Condition #1 Introduction to Wetland Biological Assessment	Total pages 43 Path <u>S:\Common\WVLCTrain\USEPA\Wetlands_1Introduction.pdf</u> <u>s:\common\courses\course4\Wetlands_1Introduction.pdf</u> USEPA <u>www.epa.gov/ost/standards</u> <u>www.epa.gov/owow/wetlands/bawwg</u>
Methods for Evaluating Wetland Condition #4 Study Design for Monitoring Wetlands	Total pages 21 Path <u>S:\Common\WVLCTrain\USEPA\Wetlands_4Studydesign.pdf</u> <u>s:\common\courses\course4\Wetlands_4Studydesign.pdf</u> USEPA <u>www.epa.gov/ost/standards</u> <u>www.epa.gov/owow/wetlands/bawwg</u>
Methods for Evaluating Wetland Condition #6 Developing Metrics and Indexes of Biological Integrity	Total pages 45 Path <u>S:\Common\WVLCTrain\USEPA\Wetlands_6Metric.pdf</u>

	<p>s:\common\courses\course4\Wetlands_6Met rices.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg</p>
Methods for Evaluating Wetland Condition #7 Wetland Classification	<p>Total pages 45 Path S:\Common\WVLCTrain\USEPA\Wetlands _7Classification.pdf s:\common\courses\course4\Wetlands_7Clas sification.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg</p>
Methods for Evaluating Wetland Condition #8 Volunteers and Wetland Biomonitoring	<p>Total pages 26 Path S:\Common\WVLCTrain\USEPA\Wetlands _8Volunteers.pdf s:\common\courses\course4\Wetlands_8Volu nteers.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg</p>
Methods for Evaluating Wetland Condition #9 Developing an Invertebrate Index of Biological Integrity for Wetlands	<p>Total pages 57 Path S:\Common\WVLCTrain\USEPA\Wetlands _9Invertbrate.pdf s:\common\courses\course4\Wetlands_9Inve rtbrate.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg</p>
Methods for Evaluating Wetland Condition #10 Using Vegetation to Assess Environmental Conditions in Wetlands	<p>Total pages 46 Path S:\Common\WVLCTrain\USEPA\Wetlands _10Vegetation.pdf s:\common\courses\course4\Wetlands_10Ve getation.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg</p>
Methods for Evaluating Wetland Condition #11 Using Algae to Assess Environmental Conditions in Wetland	<p>Total pages 49 Path S:\Common\WVLCTrain\USEPA\Wetlands _11Algae.pdf</p>

	<p>s:\common\courses\course4\Wetlands_11Algae.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg</p>
Methods for Evaluating Wetland Condition #12 Using Amphibians in Bioassessments of Wetlands	<p>Total pages 48 Path S:\Common\WVLCTrain\USEPA\Wetlands_12Amphibians.pdf s:\common\courses\course4\Wetlands_12Amphibians.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg</p>
Methods for Evaluating Wetland Condition #13 Biological Assessment Methods for Birds	<p>22 pages Path S:\Common\WVLCTrain\USEPA\Wetlands_13Birds.pdf s:\common\courses\course4\Wetlands_13Birds.pdf http://www.epa.gov/waterscience/criteria/wetlands/13birds.pdf</p>
Methods for Evaluating Wetland Condition #16 Vegetation-Based Indicators of Wetland Nutrient Enrichment	<p>29 Pages Path S:\Common\WVLCTrain\USEPA\Wetlands_16Indicators.pdf s:\common\courses\course4\Wetlands_16Indicators.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg</p>
Methods for Evaluating Wetland Condition #17 Land-Use Characterisation for Nutrient and Sediment Risk Assessment	<p>Pages 17 Path S:\Common\WVLCTrain\USEPA\Wetlands_17landuse.pdf s:\common\courses\course4\Wetlands_17landuse.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg</p>

AQUATIC ECOSYSTEM HEALTH AND IMPACT ASSESSMENT COURSE #5

Module 1.0 Introduction

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| 1. Aquatic Ecosystem Health: | Introduction, basic concepts |
| 2. Aquatic Ecosystem Health: | Anthropogenic impacts (direct and indirect), an overview, pollution – physical, chemical, biological, ecological |

Module 2.0 The Physical Component

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| 3. Physical System 1: | Alterations and impacts from land use change |
| 4. Physical System 2: | Measuring conditions, change and rates of change |
| 5. Physical System 3: | Mitigative and corrective actions |

Module 3.0 The Chemical Component

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| 6. Chemical System 1: | Nutrient and organic inputs – sources and measurements |
| 7. Chemical System 2: | Metals – sources and measurements |
| 8. Chemical System 3: | Persistent Organics 1 – sources and measurements |
| 9. Chemical System 4: | Persistent Organics 2 – sources and measurement |

Module 4.0 The Biological Component

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| 10. Biological System 1: | Species removal, species invasions/introductions |
| 11. Biological System 2: | Habitat changes from physical-chemical inputs or actions |
| 12. Biological System 3: | Habitat impact reduction and mitigation |

Module 5.0 Impacts and Change in the Aquatic Ecosystem

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|--------------------------|---|
| 13. Ecological System 1: | Changes in primary production and decomposition processes |
| 14. Ecological System 2: | Changes in nutrient cycling and impacts |

15. Ecological System 3: Changes in populations, biomass, energy flow, food web structure
16. Ecological System 4: Measuring change – basic concepts field versus laboratory
17. Ecological System 5: Measuring change – field conditions, reference condition, upstream downstream assessment
18. Ecological System 5: Measuring change – indices
19. Ecological System 6: Laboratory assays, measuring potential for change and inference
20. Ecological System 6: Biological/ecological indicators
- Module 6.0 The Fishery
21. Fish Stock Assessment: Measuring and assessing stocks, life tables
22. Fish Stocks: Assessment to management
- Module 7.0 Toxicology, Risk and Environmental Impact Assessment
23. Toxicology 1: Overview and basic principles
24. Toxicology 2: Test and organism selection, testing, analyzing and reporting the results
25. EIA: Environmental Impact Assessments – putting it together, environmental impact statements

PLUS TUTORIAL EXERCISES

Name of document	Source and path
State of the Great Lakes 2001	Path wvlc/cdbox/cd10 (1373) 1.A Primer on developing and using Indicators 2. State of the Lakes Ecosystem Conference: Selection of Indicators for Great Lakes Basin Ecosystem Health Version 4 3. State of the Lakes Ecosystem Conference 2000: Conference Proceedings
Fraser River Basin Assessment Program –	FRAP site – document # on FRAP CD1

Conceptual Monitoring Design	9315.pdf
Methods for Evaluating Wetland Condition #1 Introduction to Wetland Biological Assessment	Path S:\Common\WVLCTrain\USEPA\Wetland_1Introduction.pdf s:\common\courses\course5\Wetlands_1Introduction.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg
Methods for Evaluating Wetland Condition #10 Using Vegetation To Assess Environmental Conditions in Wetlands	Path S:\Common\WVLCTrain\USEPA\Wetland_10Vegetation.pdf s:\common\courses\course5\Wetlands_10Vegetation.pdf USEPA www.epa.gov/ost/standards www.epa.gov/owow/wetlands/bawwg
Review of Information on the Occurrence of Chemical Contaminants and Conditions of Environmental Degradation in the Aquatic Environment of the Fraser River Basin: Results Summary	FRAP site – file # on FRAP CD 1 – 9524.pdf 108 pages
Fraser River Action Plan – Resident Fish Contaminant and Health Assessment	FRAP Site – File # on FRAP CD2 – 9820.pdf pages 429
Establishing Reference Conditions for Benthic Invertebrate Monitoring in the Fraser River Catchment, British Columbia, Canada	FRAP Site – File # on FRAP CD2 – 9832.pdf 169 pages
Guidelines for Monitoring Benthos in Freshwater Environments	FRAP website – File # on FRAP CD2 – gmbf.pdf

WATER USE – COURSE #6

1. Introduction: The water cycle, water use, water loss
- Module 1.0 Agriculture
2. Crop Production: Comparison of water needs and tolerances of various crops
 3. Irrigation Methods 1: Methods, costs, efficiencies, water losses, impacts (terrestrial, surface water, groundwater)
 4. Irrigation Methods 2: Methods, costs, efficiencies, water losses, impacts (terrestrial, surface water, groundwater)
 5. Irrigation Methods 3: Methods, costs, efficiencies, water losses, impacts (terrestrial, surface water, groundwater)
 6. Salinization: Process, mitigation, management
 7. Animal Consumption: Comparison of animal husbandry practices, comparative water consumption, health and safety considerations
 8. Grazing: Stream access and damage, grazing damage (vegetation, soil and water cycle impacts)
 9. Agro-Industries: Comparison of water use, considerations of scale – e.g., feed lots, grain milling
 10. Aquaculture: Scale, requirements, concerns
- Module 2.0 Industry
11. Industrial Use: Introduction, various uses, comparison of industries
 12. Process Water:
 13. Non Process Water:
- Module 3.0 Public Water Supplies
14. Public Water Supply 1: Establishing public water supplies – groundwater and surface water – single homes, villages, towns, cities
 15. Public Water Supply 2: Water and public health
 16. Public Water Supply 3: Drinking water guidelines

- 17. Public Water Supply 4: Microbial aspects
- 18. Public Water Supply 5: Disinfectants and disinfection by-products
- 19. Public Water Supply 6: Inorganics and aesthetics
- 20. Public Water Supply 7: Organic chemicals
- 22. Public Water Supply 8: Pesticides
- 23. Public Water Supply 9: Monitoring and assessment of microbial quality
- 24. Public Water Supply 10: Monitoring and assessment of chemical quality
- 25. Public Water Supply 11: Source protection

PLUS TUTORIAL MATERIAL

Name of document	Source and path
Ground Water Education Materials – University of Minnesota, Sea Grant Minnesota	Groundwater: A Source of Wonder – Drinking Water from Wells American Ground Water Trust: Consumers Awareness Information Pamphlet #12 It contains information on – hydrological cycle, water underground (porous permeable), natural springs, how water wells are constructed, protect and conserve groundwater, some threats to groundwater and groundwater protection Path wvlc\cdbox\1 (1364)
Bacteria and Water Wells	American Ground Water Trust; Consumer Awareness Information Pamphlet # 10 Discusses Issues, importance of well water, microorganisms in groundwater, well protection strategies, treatment techniques, where to go for advice Path wvlc\cdbox\1 (1364)
Bulletin – Groundwater basics: contamination	This bulletin identifies potential sources, causes and prevention of groundwater contamination – has a lot of pictures Path wvlc\cdbox\1 (1364)
Is Your Drinking Water Safe	Gives list of what water should be tested for and a list of certified labs (just 1 page) Path wvlc\cdbox\1 (1364)

Methane in Water Wells by Donald K. Keech and Michael S. Gaber	WWJ Feb 1982 (pages 33 – 36) Path wvlc\cdbox\1 (1364)
Ground Water Education Materials – University of Minnesota, Sea Grant Minnesota	<ol style="list-style-type: none"> 1. Bacterial Safety of Well Water 2. Protecting Drinking Water through Wellhead Protection (sources of drinking water pollution, steps in preparing a wellhead protection plan, and what can you do?) 3. Groundwater and Your Health – how health risks are evaluated 4. Coliform Bacteria – fact sheet (just 1 page) 5. Bacteriological Contamination – Commonly Asked Questions and Answers 6. Nitrate in Well Water Path wvlc\cdbox\1 (1364)
The World Commission on Dams	Use Case Studies Path wvlc\cdbox\13 (1376)
Human Health and Dams –	World Health Organization Path s:\common\WHO\damsfinal.pdf s:\common\courses\course6\damsfinal.pdf
Health-Based Monitoring on Recreational Waters: The Feasibility of a New Approach (The “Annapolis Protocol”)	WHO report 50 pages Path s:\common\WHO\annapolis.pdf s:\common\courses\course6\annapolis.pdf
Water and Public Health	<p>pages 19</p> <p>Session Objectives</p> <ul style="list-style-type: none"> • To demonstrate the link between water and health and show the profound influence of water supply and quality on public health. • To describe the basic classification of water-related disease. • To describe the concept of the faecal-oral route of disease transmission and the classic waterborne disease cycle. • To describe how improvements in water supplies will lead to improvements in health and a reduction in morbidity and mortality rates. <p>Path s:\common\WHO\WHO_Train_S01.pdf s:\common\courses\course6\WHO_Train_S01.pdf</p>

<p>The WHO Guidelines for Drinking-Water Quality</p>	<p>pages 23 Session Objectives</p> <ul style="list-style-type: none"> • To introduce the latest edition of the Guidelines; identifying all three volumes and the information contained within each. • To emphasise the basic concept and the advisory nature of the Guidelines and to describe the difference between scientific risk assessment and risk management. • To provide an outline of the consultation process that resulted in the revised 2nd edition of the Guidelines. • To discuss the reasoning behind the prioritisation of microbiological quality of drinking water in the Guidelines. • To provide a basic overview of the criteria used in the selection of contaminant substances that are contained within the Guidelines. • To explain the nature of Guideline Values, highlighting substances and parameters to which they apply. • To explain the process of the rolling revision of the Guidelines. <p>Path s:\common\WHO\WHO_Train_S02.pdf s:\common\courses\course6\WHO_Train_S02.pdf</p>
<p>Microbiological Aspects</p>	<p>Path s:\common\WHO\WHO_Train_S03.pdf s:\common\courses\course6\WHO_Train_S03.pdf</p>
<p>Disinfectants and Disinfection By-Products</p>	<p>Path s:\common\WHO\WHO_Train_S04.pdf s:\common\courses\course6\WHO_Train_S04.pdf</p>
<p>Inorganic Constituents and Aesthetic Parameters</p>	<p>Path s:\common\WHO\WHO_Train_S05.pdf s:\common\courses\course6\WHO_Train_S05.pdf</p>
<p>Organic Chemicals</p>	<p>Path s:\common\WHO\WHO_Train_S06.pdf s:\common\courses\course6\WHO_Train_S06.pdf</p>
<p>Pesticides in Drinking Water</p>	<p>Path s:\common\WHO\WHO_Train_S07.pdf</p>

	s:\common\courses\course6\WHO_Train_S07.pdf
Monitoring and Assessment of Micorbiological Quality	Path s:\common\WHO\WHO_Train_S08.pdf s:\common\courses\course6\WHO_Train_S08.pdf
Monitoring and Assessment of Chemical Quality	Path s:\common\WHO\WHO_Train_S09.pdf s:\common\courses\course6\WHO_Train_S09.pdf
Guidelines for Drinking-Water Quality Volume 3	Path s:\common\WHO\WHO_Train_S10.pdf s:\common\courses\course6\WHO_Train_S10.pdf
Source Protection	Path s:\common\WHO\WHO_Train_S11.pdf s:\common\courses\course6\WHO_Train_S11.pdf
Disinfection	Path s:\common\WHO\WHO_Train_S13.pdf s:\common\courses\course6\WHO_Train_S13.pdf
Water Treatment Chemicals and Construction Materials	Path s:\common\WHO\WHO_Train_S14.pdf s:\common\courses\course6\WHO_Train_S14.pdf
Establishing National Drinking-Water Standards	Path s:\common\WHO\WHO_Train_S17.pdf s:\common\courses\course6\WHO_Train_S17.pdf
Water Treatment	Session Objectives <ul style="list-style-type: none"> • To demonstrate the need for treatment of surface waters and some groundwaters for drinking purposes. • To introduce the concept of the multiple barrier principle and to describe the more common and important key processes. • To describe the function of each treatment process in treating drinking-water. • To provide a basic outline on the selection of technology. • The discuss the assessment of water treatment plants. Path s:\common\WHO\WHO_Train_S12.pdf s:\common\courses\course6\WHO_Train

<p>The Health of Our Water – Toward sustainable agriculture in Canada</p>	<p>_S12.pdf Total pages 188 Path S:\common\wvlctrain\agriculture\AAFC_water.pdf s:\common\courses\course6\AAFC_water.pdf Chapter 1 Introduction Chapter 2 Canada’s Rural Water Resources Chapter 3 Water Use Chapter 4 Understanding Water Quality Chapter 5 Surface Water Quality Chapter 6 Groundwater Quality Chapter 7 Ecological Issues Chapter 8 Protecting Water Quality Chapter 9 Maintaining Reliable Water Supplies Chapter 10 Managing Excess Water Chapter 11 Limits on Rural Growth Related to Water Chapter 12 Concluding Remarks</p>
<p>Agricultural Management Practices for Water Quality Protection: USEPA Office of Water and The Watershed Academy</p>	<p>Path S:\Common\WVLCTrain\Agriculture\Agricultural Management Practices for Water Quality Protection.doc s:\common\courses\course6\ Agricultural Management Practices for Water Quality Protection.doc This module has two parts. Part 1 summarizes the use and value of the CORE 4 conservation practices using training materials developed by CTIC. The CORE 4 program promotes reducing non-point sources of pollution from croplands through integrated use of the four complementary practices. Total pages 41</p>
<p>Forestry Best Management: USEPA Office of Water and The Watershed Academy</p>	<p>Path s:\common\forests\Forestry Best Management.doc s:\common\courses\course6\ Forestry Best Management.doc After completing this module, you should be familiar with the steps commonly involved in planning and carrying out timber harvest and reforestation, and</p>

	<p>several of the basic ways to reduce or avoid impacts on water resources during these activities.</p> <p>Total pages 49</p>
Introduction To the Public Water System Supervision Program	<p>Total pages 125</p> <p>Path s:\common\wvlctrain\management\ Drinking Water Academy-Public Water Supply Systems_pwss.pdf</p>
Food, Soils and Agriculture	<p>Path s:\common\courses\course6\Pidwirny_Geog 210_Chapter4.doc</p>
Water Resources Issues	<p>Path s:\common\courses\course6\Pidwirny_Geog 210_Chapter8.doc</p>

WASTEWATER – COURSE #7

1. Introduction: Water cycle and waste inputs from land-based sources

Module 1.0 Rural Non-Point Sources -- Agriculture

2. Nutrients and Organics: Use and potential impacts on surface and groundwater
3. Pesticides: Use and potential impacts on surface and groundwater
4. Monitoring and Modelling: Assessments, data gathering, models
5. BMPs Crops: An examination of best management practices for yield and water efficiency
6. BMPs Animals: An examination of best management practices for animal husbandry to minimize environmental impacts and improve health

Module 2.0 Rural Point and Non-Point Sources -- Industry

7. Forestry: Sawmills and treated lumber, water use, wastewater quality, non-point source concerns, impacts, BMPs
8. Pulp and Paper: Basic processes, water use, wastewater quality,
9. Pulp and Paper 2: Discharge impacts, process change and pollution control, BMPs
10. Mining: Active mine wastes, known impacts, BMPs
11. Mining: Abandoned mines, known water quality problems and impacts, site containment and remediation
12. Refining and Smelting: Water use, water quality, known impacts, BMPs

Module 3.0 Urban Point Sources -- Municipal

13. Urban Waste Systems: An overview, the urban water cycle and integrated urban water management
14. Sanitary Waste 1: Village and small settlement – systems, capacities, problems and solutions
15. WWTPs: Process and technology overview, wastewater streams, size and efficiency, site location
16. WWTPs: Process details and design, primary and secondary treatment

17. WWTPs 2: Tertiary Treatment, final effluent quality, biosolids, maintenance, process control and monitoring

Module 4.0 Urban Point Sources -- Industrial

18. Industrial Wastes 1:

19. Industrial Wastes 2:

20. Municipal-Industrial: Industrial waste streams and WWTPs

Module 5.0 Urban Non-Point Sources

21. Urban Stormwater: Overview, conventional and non-conventional systems

22. Urban Stormwater 2: CSOs, storm sewers, modelling and management, water quality, WWTP considerations

23. Urban Stormwater 3: Industrial site runoff

24. Solid Waste: Overview, industrial and municipal solid waste, solids from waste stream, quantity and quality considerations

25. Solid Waste 2: Water quality impacts (surface and groundwater), short-term to long-term planning and management

PLUS TUTORIAL MATERIAL

Name of document	Source and path
<p>The National Sewage Report Card (Number Two) Rating the Treatment Methods and Discharges of 21 Canadian Cities</p>	<p>3 Canada's Sewage Problem: Still A National Disgrace 7 Why Sewage Is A Problem 11 Endocrine Disruption 101 15 Types of Treatment 19 'Excremental' Progress At A Glance 20 Evaluation of 21 Canadian Cities 20 Victoria 22 Vancouver 24 Edmonton 25 Calgary 26 Regina 27 Saskatoon 28 Brandon 30 Winnipeg 31 Hamilton-Wentworth</p>

	<p>32 Toronto 34 Ottawa 35 Montreal 36 Quebec City 37 Saint John 38 Fredericton 39 Charlottetown 40 Halifax 42 St. John's 43 Yellowknife 44 Whitehorse 45 Dawson City</p> <p>46 Sewage Success Stories 49 Sludge Happens 52 Source Control 56 A History Of Inaction 60 References</p> <p>Path S:\Common\WVLCGeneral\Temp\Sewage.pdf s:\common\courses\course7\Sewage.pdf</p>
How WasteWater Treatment Works – The Basics	<p>USEPA wvlc\urban\6 s:\common\wvlcTrain\USEPA\USEPA-WastewaterTreatment-bastre.pdf s:\common\courses\course7\USEPA-WastewaterTreatment-bastre.pdf</p>
Treatment Technologies and Best Management Practices	<p>s:\common\WVLCTrain\USEAP\ BMP-Animal Feeding Opeations_DDChapters8.pdf s:\common\courses\course7\ BMP-Animal Feeding Opeations_DDChapters8.pdf</p>
Wastewater Re-use, Stormwater Management and the National Water Reform Agenda	<p>wvlc\urban\3 s:\common\IWRMreference\CSIRO_RP P1.pdf s:\common\courses\course7\CSIRO_RPP1.pdf</p>
Recommended Guidelines for Wastewater Characterization in the Fraser River Basin	<p>FRAP Site – document # on FRAP CD 1 9310.pdf 75 pages</p>
Recommended Guidelines for Wastewater Characterization in the Fraser River Basin	<p>FRAP site – document # on FRAP CD1 – 9311.pdf 94 pages</p>
Effluent Characterization Study: Volume 1	<p>FRAP site – document # on FRAP CD1 – 9313.pdf</p>

	227 pages
Septic System Maintenance: Pure and Simple	FRAP site – document # on FRAP CD2 – p&s.pdf 60 pages
Wastewater Characterization of Fish Processing Plant Effluents	FRAP site – document # on FRAP CD1 – 9339.pdf 146 pages
Environment Canada Industrial Programs Section Environmental Protection – Guide for Best Practices for Process Water Management at Fish Processing Plans in British Columbia	FRAP site – document # on FRAP CD1 – 9420.pdf 130 pages
Sewage Lagoon Design Using Wetlands and other upgrading Technologies to achieve Non-Acutely Toxic effluent	FRAP site – document # on FRAP CD1 – 9434.pdf 230 pages
Reference Workbook: Pollution Prevention Plans	FRAP site – document # on FRAP CD1 – 9435.pdf 81 pages
Technical Guide for the Development of Pollution Prevention Plans for Fish Processing Operations in the Lower Fraser Basin	FRAP site – document # on FRAP CD1 – 9523.pdf 107 pages
Agricultural Nutrient Pathways	FRAP site – document # on FRAP CD1 – 9528.pdf 27 pages
Study of Water Conservation As a means to improve wastewater treatment and reduce treatment costs	FRAP site – document # on FRAP CD2 – 9622.pdf 149 pages
Description of selected waste management problems: options and strategies	FRAP site – document # on FRAP CD2 – 9629.pdf 66 pages
Management of Agricultural Wastes in the Lower Fraser Valley	FRAP site – document # on FRAP CD2 – 9630.pdf 47 pages
Water Management	18 Pages Source www.gov.on.ca/OMAFRA/english/environment/water/water_mgmt.htm Path s:\Common\WVLCTrain\Agriculture\Water Management.doc s:\common\courses\course7\Water Management.doc
Georgia Stormwater Management Manual (Technical Handbook) Volume 2	Cover page path S:\Common\WVLCTrain\Urban\Georgia Stormwater Management

	<p>Manual-TechnicalManual-cover.pdf s:\common\courses\course7\ Georgia Stormwater Management Manual-TechnicalManual-cover.pdf TABLE OF CONTENTS path S:\Common\WVLCTrain\Urban\GSM-TM-TOC.pdf s:\common\Courses\Course7\GSM-TM-TOC.pdf all chapters are in s:\common\Courses\Course7\GSM INTRODUCTION Objective of the Manual Organisation of the Manual CHAPTER 1 – STORMWATER MANAGEMENT PLANNING AND DESIGN 1.1 The Need for Stormwater Management 1.2 Stormwater Management Standards 1.3 Unified Stormwater Sizing Criteria 1.4 Stormwater Better Site Design 1.5 Stormwater Site Planning . CHAPTER 2 – STORMWATER HYDROLOGY 2.1 Methods for Estimating Stormwater Runoff . 2.2 Storage Design 2.3 Outlet Structures CHAPTER 3 – STRUCTURAL STORMWATER CONTROLS 3.1 Structural Stormwater Controls Overview 3.2 General Application Structural Stormwater Controls 3.2.1 Stormwater Ponds 3.2.2 Stormwater Wetlands. 3.2.3 Bioretention Areas. 3.2.4 Sand Filters 3.2.5 Infiltration Trenches 3.2.6 Enhanced Swales 3.3 Limited Application Structural Stormwater Controls 3.3.1 Filter Strip 3.3.2 Grass Channel 3.3.3 Organic Filter</p>
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	<p>3.3.4 Underground Sand Filter 3.3.5 Submerged Gravel Wetlands 3.3.6 Gravity (Oil-Grit) Separator 3.3.7 Porous Concrete 3.3.8 Modular Porous Paver Systems 3.3.9 Alum Treatment System controls. 3.4 Detention Structural Stormwater Controls 3.4.1 Dry Detention / Dry ED Basins. 3.4.2 Multi-Purpose Detention Areas 3.4.3 Underground Detention CHAPTER 4 – STORMWATER DRAINAGE SYSTEM DESIGN 4.1 Stormwater Drainage Design Overview 4.2 Minor Drainage System Design 4.3 Culvert Design 4.4 Open Channel Design 4.5 Energy Dissipation Design APPENDIX A – RAINFALL TABLES FOR GEORGIA APPENDIX B – SOILS INFORMATION FOR GEORGIA APPENDIX C – MISCELLANEOUS SPECIFICATIONS APPENDIX D – STRUCTURAL STORMWATER CONTROL DESIGN EXAMPLES D1 Stormwater Pond D2 Bioretention Area D3 Sand Filter D4 Infiltration Trench D5 Enhanced Swale APPENDIX E – STRUCTURAL CONTROL MAINTENANCE CHECKLISTS APPENDIX F – LANDSCAPING AND AESTHETICS GUIDANCE APPENDIX G – STORMWATER COMPUTER MODELS APPENDIX H – GEORGIA SAFE DAMS ACT</p>
<p>Georgia StormWater Management Manual Volume 1: Stormwater Policy Guidebook</p>	<p>Path S:\Common\WVLCTrain\Urban\GSM-Policy_gsmmvol1.pdf s:\common\courses\course7\ GSM-Policy_gsmmvol1.pdf</p>

	<p>Total pages 158 Volume 1 (Policy Guidebook) Georgia Stormwater Management Manual i TABLE OF CONTENTS FORWARD Preface Acknowledgements INTRODUCTION Objective of the Manual Organization of the Manual Users of this Volume How to Use this Volume. Regulatory Status of the Manual How to Get Printed Copies of the Manual. How to Find the Manual on the Internet Contact Information CHAPTER 1 – THE CASE FOR STORMWATER MANAGEMENT 1.1 Impacts of Development and Stormwater Runoff 1.1.1 Development Changes Land and Runoff 1.1.2 Changes to Stream Flow. 1.1.3 Changes to Stream Geometry 1.1.4 Impacts to Aquatic Habitat 1.1.5 Water Quality Impacts 1.1.6 Stormwater Hotspots 1.1.7 Effects on Lakes, Reservoirs and Estuaries 1.2 Stormwater Impacts on Georgia Communities 1.3 Addressing Runoff Impacts Through Stormwater Management CHAPTER 2 – REGULATORY REQUIREMENTS FOR GEORGIA COMMUNITIES 2.1 Overview 2.2 Stormwater Quantity and Flooding Prevention Regulations 2.2.1 National Flood Insurance Program 2.2.2 Georgia Safe Dams Act 2.3 Water Quality Regulations 2.3.1 Municipal NPDES MS4 Stormwater Permit Program 2.3.2 Industrial NPDES Stormwater Permit Program.</p>
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	<p>2.3.3 NPDES Stormwater Permits for Construction Areas</p> <p>2.3.4 NPDES Municipal Wastewater Discharge Permit Program</p> <p>2.3.5 Erosion and Sedimentation Control Act</p> <p>2.3.6 Total Maximum Daily Load Program</p> <p>2.3.7 Georgia Planning Act – River Corridor Protection</p> <p>2.3.8 Georgia Planning Act – Water Supply Watersheds</p> <p>2.3.9 Georgia Planning Act – Groundwater Recharge Areas</p> <p>2.3.10 Safe Drinking Water Act – Wellhead Protection Program</p> <p>2.3.11 Source Water Assessment Program.</p> <p>2.3.12 Metropolitan River Protection Act</p> <p>2.3.13 Wetlands–Federal 404 Permits and Georgia Planning Act.</p> <p>2.3.14 Coastal Management Program</p> <p>2.3.15 Coastal Marshlands Protection Act</p> <p>2.3.16 Georgia Greenspace Program</p> <p>CHAPTER 3 – LOCAL STORMWATER MANAGEMENT PROGRAMS</p> <p>3.1 Overview of Local Stormwater Management Programs</p> <p>3.1.1 Introduction</p> <p>3.1.2 Elements of a Comprehensive Local Stormwater Management Program.</p> <p>3.2 Developing an Effective Local Stormwater Management Program</p> <p>3.2.1 Introduction.</p> <p>3.2.2 Defining Problems, Program Goals and Requirements</p> <p>3.2.3 Determining Program Components and Priorities .</p> <p>3.2.4 Organizing Program Structure and Staffing</p> <p>3.2.5 Funding the Program.</p> <p>3.2.6 Implementing the Program</p> <p>3.2.7 Conclusion</p> <p>CHAPTER 4 – IMPLEMENTING STORMWATER MANAGEMENT REQUIREMENTS FOR DEVELOPMENT</p> <p>4.1 Overview.</p> <p>4.2 Minimum Standards for Development</p>
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	<ul style="list-style-type: none"> 4.2.1 Introduction. 4.2.2 Applicability. 4.2.3 Minimum Stormwater Management Standards 4.3 Stormwater Better Site Design Practices <ul style="list-style-type: none"> 4.3.1 Introduction. 4.3.2 Suite of Stormwater Better Site Design Practices 4.3.3 Implementing Stormwater Better Site Design 4.4 Unified Stormwater Sizing Criteria . <ul style="list-style-type: none"> 4.4.1 Introduction 4.4.2 Water Quality. 4.4.3 Channel Protection . 4.4.4 Overbank Flood Protection 4.4.5 Extreme Flood Protection 4.4.6 Incorporating the Unified Stormwater Sizing Criteria into Development Requirements 4.5 Stormwater Site Design Credits <ul style="list-style-type: none"> 4.5.1 Introduction . 4.5.2 Site Design Credit #1: Natural Area Conservation. 4.5.3 Site Design Credit #2: Stream Buffers. 4.5.4 Site Design Credit #3: Vegetated Channels . 4.5.5 Site Design Credit #4: Overland Flow Filtration / Groundwater Recharge Zones 4.5.6 Site Design Credit #5: Environmentally Sensitive Large Lot Subdivisions. 4.5.7 Implementing Stormwater Site Design Credits . 4.6 Downstream Assessments <ul style="list-style-type: none"> 4.6.1 Introduction 4.6.2 Reasons for Downstream Problems 4.6.3 Downstream Assessments: The "Ten-Percent" Rule 4.6.4 Adopting a Downstream Assessment Requirement 4.7 Guidance on Structural Stormwater Controls . <ul style="list-style-type: none"> 4.7.1 Introduction 4.7.2 Recommended Structural Stormwater
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	<p>Control Practices for Georgia Communities 4.7.3 Suitability of Structural Stormwater Controls to Meet Stormwater Management Requirements 4.7.4 Implementing Application and Design Criteria for Structural Stormwater Controls 4.8 Stormwater Management Site Plans . 4.8.1 Introduction 4.8.2 Contents of a Stormwater Management Site Plan. 4.8.3 Procedure for Reviewing Stormwater Site Plans CHAPTER 5 – WATERSHED-BASED STORMWATER PLANNING 5.1 Stormwater Master Planning . 5.1.1 Introduction . 5.1.2 Types of Stormwater Master Planning 5.2 Comprehensive Watershed Planning for Georgia Communities 5.2.1 Introduction 5.2.2 Scale of Watershed Management 5.2.3 The Watershed Planning Process 5.3 Integration of Site and Watershed-Level Stormwater Planning . 5.3.1 Introduction 5.3.2 Using the Local Review Process to Comply with Watershed Plans 5.4 Inter-jurisdictional Watershed Planning 5.5 Implementation of Watershed Plans 5.5.1 Introduction . 5.5.2 Tools of Watershed Management and Protection 5.5.3 Stakeholder Involvement Techniques. 5.5.4 Cost (Budget) 5.5.5 Performance Monitoring and Assessment iv Georgia Stormwater Management Manual Volume 1 (Policy Guidebook) 5.6 Regional vs. On-site Stormwater Management 5.6.1 Introduction. 5.6.2 Advantages and Disadvantages of Regional</p>
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	<p>Stormwater Controls.</p> <p>5.6.3 Important Considerations for the Use of Regional Stormwater Controls..</p> <p>CHAPTER 6 – FLOODPLAIN MANAGEMENT</p> <p>6.1 Local Floodplain Management and Stormwater Management</p> <p>6.1.1 Introduction</p> <p>6.1.2 Floodplain Management Goals</p> <p>6.2 National Flood Insurance Program</p> <p>6.2.1 Background</p> <p>6.2.2 NFIP Program Requirements.</p> <p>6.2.3 Shortcomings of the NFIP</p> <p>6.3 Strategies and Tools for Improved Floodplain Management</p> <p>6.3.1 Introduction</p> <p>6.3.2 Developing an Effective Local Floodplain Management Program</p> <p>6.3.3 Watershed / Inter-jurisdictional Issues</p> <p>CHAPTER 7 – STORMWATER SYSTEM OPERATIONS AND MAINTENANCE</p> <p>7.1 Local Stormwater Operations and Maintenance Programs .</p> <p>7.1.1 Introduction.</p> <p>7.1.2 Key Maintenance Program Components</p> <p>7.2 Implementing An Effective Operations and Maintenance Program.</p> <p>7.2.1 Maintenance Responsibility</p> <p>7.2.2 Level of Service</p> <p>7.2.3 Establishing Maintenance Responsibility and Level of Service Policies</p> <p>7.2.4 Maintenance Agreements</p> <p>7.2.5 Education</p> <p>7.2.6 Periodic Review of Regulations and Procedures.</p> <p>7.3 Stormwater Retrofitting</p> <p>7.3.1 Introduction</p> <p>7.3.2 Stormwater Retrofitting Process</p> <p>7.3.3 Types of Retrofitting Techniques</p> <p>CHAPTER 8 – STORMWATER POLLUTION PREVENTION</p>
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	<p>PROGRAMS</p> <p>8.1 Stormwater Pollution Prevention.</p> <p>8.1.1 Introduction</p> <p>8.1.2 Local Stormwater Pollution Prevention Activities.</p> <p>CHAPTER 9 – INFORMATION TOOLS FOR LOCAL STORMWATER MANAGEMENT</p> <p>9.1 Overview</p> <p>9.2 Stormwater Management System Inventories.</p> <p>9.2.1 Introduction</p> <p>9.2.2 Organizing Information</p> <p>9.2.3 Conducting the Inventory</p> <p>9.3 Geographic Information Systems</p> <p>9.3.1 Introduction</p> <p>9.3.2 GIS Components</p> <p>9.3.3 GIS Functions</p> <p>9.3.4 Use of GIS in Stormwater Management</p> <p>9.3.5 Other Related Technologies</p> <p>9.4 Global Positioning Systems</p> <p>9.4.1 Introduction</p> <p>9.4.2 GPS Applications to Stormwater</p> <p>9.5 Remote Sensing</p> <p>9.5.1 Introduction</p> <p>9.5.2 Digital Orthophoto Quarter Quadrangles .</p> <p>9.5.3 Remote Sensing Applications for Stormwater</p> <p>9.6 Computer Models</p> <p>9.6.1 Introduction</p> <p>9.6.2 Types of Models.</p> <p>9.6.3 Model Applications</p> <p>9.6.4 Basic Computer Modeling Principles</p> <p>9.6.5 Selecting the Appropriate Computer Model</p> <p>APPENDIX A – CONTACT AGENCIES FOR STORMWATER MANAGEMENT REGULATIONS AND PROGRAMS</p> <p>APPENDIX B – STORMWATER SITE PLAN REVIEW CHECKLISTS</p> <p>APPENDIX C – EXAMPLE STORMWATER FACILITY MAINTENANCE AGREEMENT</p> <p>REFERENCES</p>
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Water Resources Issues	Path s:\common\courses\course6\Pidwirny_Geog 210_Chapter8.doc
Waste Management	Path s:\common\courses\course6\Pidwirny_Geog 210_Chapter11.doc

GOVERNANCE AND COMMUNITY BASED APPROACHES

Course #8

1. Introduction: An overview of governance and community based integrated water resources management.

Module 1.0 Governance and International Law

2. Domestic Governance: Constitutional and jurisdictional responsibility.
3. Domestic Governance 2: Laws, regulations, policies, enforcement -- national and regional governance.
4. Domestic Governance 3: Agencies, mandates, interactions.
5. Domestic Governance 4: Laws, regulations, policies, enforcement -- municipal level.
6. International Governance: International relations, laws, treaties, agreements.
7. International Governance: Conflict avoidance, conflict resolution.

Module 2.0 Community Based Management

8. Placed Based Approaches: .
9. Community Involvement: Public awareness, engagement, involvement.
10. Community Involve 2: Public education programs, public consultation, public response.
11. Community Involve 3: Stakeholders, land owners, education, information and incentive programmes.
12. Community Involve 4: Community based projects and assessments.

Module 3.0 Gender and?

13. Gender 1: .
14. Gender 2: .
15. Gender 3: .

PLUS TUTORIAL MATERIAL

Name of the document	Source and Path
Mainstreaming Gender in Water Resources Management – Why and How, Oct 1999	Contents – 1. towards a vision of equity and sustainability 2. Before and after – the gender approach 3. Why a gender approach 4. the gender approach 5. The gender approach in action – examples from the field 6. Mainstreaming the gender perspective in water resource management 7. Benefits of gendered water management 8. Benefits of gendered water management s:\common\wvlctrain\gender\Gender~2.pdf
Toolkit in Gender in Water and Sanitation, World Bank	Total pages 181 Contents Foreword Acknowledgments vii Acronyms viii Chapter 1: Purpose of Toolkit 2 Organization of Toolkit 2 Chapter 2: Gender Issues in the Water and Sanitation Sector 4 A. What is Gender? 4 B. What is Gender Analysis? 4 C. Principles of Sound Water and Sanitation Management 4 D. From Principles to Action 5 E. Borrower Country Ownership 7 F. Institutional Capacity 7 Chapter 3: Lessons from Project Experience 9 A. Introduction 9 Lesson 1: Gender is a central concern in water and sanitation. 10 Lesson 2: Ensuring both women's and men's participation improves project performance. 11 Lesson 3: Specific, simple mechanisms must be created to ensure women's involvement. 12 B. Country and Sector Work 14 Lesson 4: Attention to gender needs to start as early as possible. 14 C. Gender in the Program Cycle 14 Identification 15 Lesson 5: Gender analysis is integral to project identification and data collection. 15 Project Preparation and Appraisal 18

	<p>Lesson 6: A learning approach is more gender-responsive than a blueprint approach. 18</p> <p>Lesson 7: Projects are more effective when both women's and men's preferences about "hardware" are addressed. 19</p> <p>Implementation 22</p> <p>Lesson 8: Women and men promote project goals through both their traditional and nontraditional roles. 22</p> <p>Lesson 9: Non-governmental organizations and especially women's groups can facilitate a gender-balanced approach. 26</p> <p>Supervision, Monitoring and Evaluation 27</p> <p>Lesson 10: Gender-related indicators should be included when assessing project performance. 27</p> <p>Chapter 4: Good Practice on Gender in Water and Sanitation 32</p> <p>A. Listening to Women in Project Design: the Baku Water Supply Project 32</p> <p>B. Involving Local Communities in Low-Income Sanitation in Brazil 34</p> <p>iii</p> <p>Toolkit on Gender in Water and Sanitation</p> <p>C. Gender as a Critical Variable in Lesotho's Rural Sanitation Program 36</p> <p>D. Learning About Integrating Gender Through a Pilot Project in Nepal 38</p> <p>E. Integrating Gender into a Community-Based Project in Sri Lanka 40</p> <p>Appendix 1: Where to Turn to for Advice 43</p> <p>A. Bank Staff Working on Water and Sanitation and Gender 43</p> <p>B. Selected Agencies Working on Gender Issues in Water and Sanitation 45</p> <p>Appendix 2: Terms of Reference for Consultants 53</p> <p>A. TORs for a Gender Specialist in the Water and Sanitation Sector 53</p> <p>B. TORs for Gender Analysis During the Preparation and Design Phases 54</p> <p>C. TORs for Gender Analysis During the Implementation Phase 54</p> <p>D. TORs for Gender Analysis During Monitoring and Evaluation 55</p> <p>Appendix 3: Sources of Funding 57</p>
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<p>Integrating a Gender Dimension into Monitoring and Evaluation of Rural Development Projects</p>	<p>Total pages 12</p> <p>Path s:\common\wvlcgeneral\Gender_RDV%20Toolkit%2012-18-01</p>

	<p>s:\common\courses\course8\Gender_RDV%20Toolkit%2012-18-01.pdf</p>
<p>Institutional Framework, Session Objectives</p>	<p>Total pages 16 Session Objectives</p> <ul style="list-style-type: none"> • To describe the key players in the water sector and describe their roles and interaction. • To describe how the water supply sector should be structured and emphasise the need for a clear institutional framework to be established. • To demonstrate the need for inter-sectoral and inter-institutional collaboration at all levels. • To describe the key elements of legislation required for effective monitoring linked to water supply improvement. <p>Path s:\common\WHO\WHO_Train_S15.pdf s:\common\courses\course8\WHO_Train_S15.pdf</p>
<p>Legislative Frameworks, WHO Seminar Pack for Drinking-Water Quality</p>	<p>Total pages 22</p> <p>Legislative Frameworks Session Objectives</p> <ul style="list-style-type: none"> • To highlight the need for a clear and comprehensive legislative framework for the water sector as a means of promoting its effective functioning. • To describe the mechanisms for establishing legislation and outline the basic content of water sector legislation. • To stress the need to view surveillance and quality control of water supply in a broader context and recognise the value of such programmes beyond simple compliance monitoring. • To emphasise the risks of over-reliance on legalistic approaches to water quality and to promote greater openness regarding water quality information. <p>Path s:\common\WHO\WHO_Train_S16.pdf s:\common\courses\course8\WHO_Train_S16.pdf</p>
<p>Cost Recovery</p>	<p>Total pages 22 Cost Recovery Session Objectives</p>

	<ul style="list-style-type: none"> • To highlight the need for cost recovery by some mechanisms in the water sector to ensure sustainability and to highlight the consequence of under-investment in water supply. • To describe some of the commonly used mechanisms for recovering costs, including the • To describe some common charging policies and highlight the need to implement charging mechanisms which promote both universal coverage and the rational use of • To highlight the need to keep water charges affordable and to highlight the dangers of disconnection policies for public health. <p>Path s:\common\WHO\WHO_Train_S19.pdf s:\common\courses\course8\WHO_Train_S19.pdf</p>
Reaching New Heights: A Handbook for developing Community Based Ecosystem Health Goals, Objectives and Indicators	Total pages 98 The process described in this manual is based largely on the experiences of the Salmon River Watershed Roundtable (SRWR), a community based group from British Columbia’s interior which has been working to improve the health of their ecosystem. The SRWR developed goals, objectives and indicators of ecosystem health using a process (described herein) published by the Canadian Council of Ministers of the Environment. The manual is divided into five chapters, each describing building blocks needed to develop and use ecosystem health goals, objectives and indicators. Chapter 1 defines these tools as well as some key terms used throughout the manual. Chapter 2 provides suggestions to get ready for this process. Chapter 3 proposes methods which your community could use to develop ecosystem health goals, objectives and indicators, and Chapter 4 goes on to suggest how these tools could be used in monitoring, action planning, and reporting. Finally, Chapter 5 gives you some hints on customizing this process for your own community. Additional resources are provided in the appendices. Path: FRAP CD2\9717.pdf
An Evaluation of the Collaboration	Total pages 35

<p>Towards Ecosystem Objectives and a Watershed Vision The Salmon River Watershed</p>	<p>Table of Contents List of Tables and Figures List of Acronyms Forward Executive Summary 1.0 Introduction 1.1 Research Goal and Objectives 1.2 Rationale 1.3 Scope of Study 1.4 Overview of Research Methods 2.0 Background 2.1 The Ecosystem Approach 2.2 Ecosystem Objectives 2.2.1 History of Ecosystem Objectives Initiatives 2.2.2 A Framework for Developing Ecosystem Health Goals, Objectives and Indicators 2.3 Community Participation Processes 2.4 Collaboration Theory 3.0 Case Study Overview 3.1 Social and Economic Profile 3.2 Resource Use and Environmental Issues 3.3 The Salmon River Watershed Roundtable 4.0 Case Study Evaluation 4.1 Comparison of the Case Study to the 5- Stage Collaborative Model 4.1.1 Antecedents 4.1.2 Problem Setting 4.1.3 Direction Setting 4.1.4 Structuring and Outcomes 4.2 Evaluation by Case Study Participants 4.2.1 General Approach of the Roundtable 4.2.2 Problems and Issues 4.2.3 Underlying Philosophy of the Roundtable 4.2.4 Roles of Different Participants 4.2.5 Participation 4.2.6 Education and Preparation 4.2.7 Building Support 4.2.8 Action Outcomes 4.2.9 Perceived Benefits 4.3 Other Issues Raised 5.0 General Conclusions 6.0 Recommendations 6.1 Future Assessment of Productivity 6.2 Power, Authority and Accountability</p>
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	<p>6.3 Cultural Sensitivity and Appropriateness 7.0 References Appendix A: Interim Ecosystem Objectives for the Salmon River Watershed Appendix B: Questions used in interviews and surveys</p> <p>Path: FRAP CD2\9616.pdf</p>
<p>USING SUBSIDIES TO PROMOTE ENVIRONMENTAL PROTECTION IN AGRICULTURE: A Review of Programs in North America and Europe</p>	<p>total pages 38</p> <p>CONTENTS</p> <p>1. Introduction</p> <p>2. Subsidies For Environmental Protection Measures Management Practice Subsidies Canadian Programs European Programs Management Subsidies for Environmentally Sensitive Areas Potential for Environmental Management Subsidies in British Columbia Set-aside and Acreage Reduction Programs Canadian Programs American Programs European Programs Potential for Set-Aside Programs in British Columbia North American Waterfowl Management Plan Potential for improvements to the Pacific Coast Joint Venture Subsidies for Equipment and Capital Improvement British Columbia Other Jurisdictions Provision of Farm Infrastructure Incentives for Organic Farming Conclusions and Summary</p> <p>3. Cross Compliance Measures Cross-compliance Measures In Canada Major Support Programs in British Columbia The Potential for Cross-compliance in Canada</p> <p>4. Conclusions List of references</p> <p>Path: FRAP CD1\9341.pdf</p>
<p>Economic Instruments and the</p>	<p>Total pages 178</p>

Environment: Selected Legal Issues	<p>Chapter 1. The Constitutional Context</p> <p>Chapter 2. Administrative Law and Statutory Drafting</p> <p>Chapter 3. Discharge Fees, Administrative Penalties and Ticketing</p> <p>Chapter 4. Deposit Refund Systems</p> <p>Chapter 5. Tradeable Permit Systems</p> <p>Path: FRAP CD1\9329.pdf</p>
Getting In Step – A Guide to Effective Outreach in Your Water Shed	<p>Total pages 30</p> <p>s:\common\WVLCTrain\Governance\Getting In Step.doc</p>

ORGANIZATIONAL INFRASTRUCTURE AND MANAGEMENT – COURSE #9

1. Introduction: An overview of the multiplicity of water resources management requirements and their integration.

Module 1.0 Management and Operations

2. Management: Finance, budget, planning cycles, capital expenditures, operations and maintenance
3. Management 2: Economic development, policy conflict, policy analysis, integrated policy development
4. Management 3: Support infrastructure, research, monitoring, policy and planning, enforcement
5. Management 4: Laboratories – analytical requirements (ambient, drinking, wastewater), capabilities, costs, procedures
6. Management 5: Laboratories – QA/QC, control, certification, audit, performance, maintenance
7. Management 6: Personnel education, training and development, human resources planning
8. Management 7: Public and private models and partnerships

Module 2.0 Public Health and Public Health Administration

9. Public Health: Water related health problems, epidemiology, tracking, analysis and response
10. Public Health 2: Public health administration
11. Public Health 3: Public health education

Module 3.0 Project Management

12. Project P&M: Project programming, identification, formulation
13. Project P&M 2: Project financing, implementation, evaluation
14. Contract Management: Contract writing, terms of reference, scheduling, evaluation
15. Disasters & Emergencies: Emergency planning, preparedness and response

PLUS TUTORIAL MATERIAL

Name of the Document	Source or Path
Document from European Union	<p>Chapter 5 - Introduction</p> <p>Chapter 6 – Programming (pages 12) S:\Common\WVLCTrain\EuropeanUnion\EU-Guide_prog_all_en.pdf S:\Common\Courses\Course 9\EU Doc\EU-Guide_prog_all_en.pdf</p> <p>Chapter 7 – Identification (pages 34) S:\Common\WVLCTrain\EuropeanUnion\EU-Guide_iden_all_en.pdf S:\Common\Courses\Course 9\EU Doc\EU-Guide_iden_all_en.pdf</p> <p>Chapter 8 – Formulation (pages 36) S:\Common\WVLCTrain\EuropeanUnion\EU-Guide_form_all_en.pdf S:\Common\Courses\Course 9\EU Doc\EU-Guide_form_all_en.pdf</p> <p>Chapter 9 – Financing (pages 10) S:\Common\WVLCTrain\EuropeanUnion\EU-Guide_fina_all_en.pdf S:\Common\Courses\Course 9\EU Doc\EU-Guide_fina_all_en.pdf</p> <p>Chapter 10 – Implementation (pages 10) S:\Common\WVLCTrain\EuropeanUnion\EU-Guide_imp_all_en.pdf S:\Common\Courses\Course 9\EU Doc\EU-Guide_imp_all_en.pdf</p> <p>Chapter 11 – Evaluation (pages 10) S:\Common\WVLCTrain\EuropeanUnion\EU-Guide_eval_all_en.pdf S:\Common\Courses\Course 9\EU Doc\EU-Guide_eval_all_en.pdf</p>
Human Resources, WHO Seminar Pack for Drinking Water Quality	<p>Total pages 21</p> <p>Session Objectives</p> <ul style="list-style-type: none"> • To describe the human resource requirements of monitoring programmes, whether quality control or surveillance, for all levels of staff. • To highlight the need for a broad approach to human resources development, including career development structures, overall staffing and training. • To emphasise the need for and value of ongoing investment in staff in terms of training, delegation of responsibility and encouragement to join professional bodies

	<p>and undertake applied research.</p> <ul style="list-style-type: none"> • To briefly describe some key responsibilities of managerial, analytical, field and data management staff. <p>Path: s:\common\who\WHO_Train_S18.pdf S:\Common\Courses\Course 9\WHO_Train_S18.pdf</p>
Water and Public Health	<p>Session Objectives (pages 19)</p> <ul style="list-style-type: none"> • To demonstrate the link between water and health and show the profound influence of water supply and quality on public health. • To describe the basic classification of water-related disease. • To describe the concept of the faecal-oral route of disease transmission and the classic waterborne disease cycle. • To describe how improvements in water supplies will lead to improvements in health and a reduction in morbidity and mortality rates. <p>Path: s:\common\who\WHO_Train_S01.pdf S:\Common\Courses\Course 9\WHO_Train_S01.pdf</p>
Statewide Watershed Management, J. Trevor Clements	<p>Total pages 19</p> <p>s:\common\wvlcTrain\Management\Environmental managers in today.doc</p>

APPLYING INTEGRATED WATER RESOURCES MANAGEMENT

Course #10

Review the Water Cycle, points of anthropogenic impacts, sustainable management and the concepts of IWRM and introduce the first group of exercises.

An exercise, using case study data for each of the 8 courses (2-9). This suggests a minimum of 8 sessions, although more may be required where several aspects of data collection and analysis are required. Exercises should use a matrix approach, showing all of the information and data to be filled in, but highlighting the ones being worked on currently.

Final session should provide a case study (studies) with the most complete data sets and allow the student to do a complete analysis (or nearly) of an existing watershed (this will require a lot of data). This exercise should also include a local case study, even if the data are largely missing or the records are short or missing.

The course content may also include any, or all of the following things:

Preparing a Water Budget for a watershed/sub-watershed either from a provided case study or one where the student can obtain information of on their own.

Doing a water demand analysis and future projection.

Performing and writing a report on a specific Risk Assessment (possibly both a human health one and an ecological one).

Writing an Environmental Impact Assessment Statement.

Writing a contract for piece of work.

Evaluating one or more technology proposals.

Using one or more mathematical models to examine and evaluate a problem.

Go through (write-up) a complete project (programming, identification, formulation, financing, implementation and evaluation)

Writing a project grant/loan proposal for GEF or the World Bank.

Name of the Document	Source or Path
Linking Traditional ecological Knowledge and SOLEC: Summary and Final Recommendations	Contents 1. Introduction 2. A brief history of SOLEC 3. SOLEC and TEK: A SOLEC 2000 initiative

	<p>4. Background to TEK</p> <p>5. Past Attempts at TEK use in Ontario Environmental Projects</p> <p>6. TEK and SOLEC – why the status quo won't work</p> <p>7. Co-existence – a new first nations/environment Canada relationship</p> <p>Path wvlc\cdbox\CD 10 (1373)</p>
Naturalized Knowledge Systems	Path wvlc\cdbox\CD 10 (1373)
Volunteer-Based Monitoring Program for the Salmon River Basin: Using Benthic Indicators to Assess Stream Ecosystem Health	<p>Pages 82</p> <p>Path FRAP CD2\9709.pdf</p> <p>TABLE OF CONTENTS</p> <p>Executive Summary ii</p> <p>Sommaire iii</p> <p>1. Introduction 1</p> <p>1.1. Introduction to the Ecosystem Approach 1</p> <p>1.2. Benthic Macroinvertebrates in Volunteer-Based Monitoring 2</p> <p>1.3. Development of a Volunteer Monitoring Program for the Salmon River 3</p> <p>1.4. Organization of Report 3</p> <p>2. The Salmon River Watershed 5</p> <p>2.1. Location 5</p> <p>2.2. Topography and Hydrology 6</p> <p>2.2.1. Discharge 8</p> <p>2.3. Land Use 9</p> <p>2.3.1. Agriculture (summarized from McPhee et al. 1996) 9</p> <p>2.3.2. Forestry (summarized from G. Wellburn, Riverside Forest Products Ltd. in Environment Canada, 1995) 9</p> <p>2.3.3. Recreation (summarized from McPhee et al. 1996) 10</p> <p>2.4. Impacts and Remediation 10</p> <p>3. Sampling Locations and Baseline Biomonitoring Data 12</p> <p>3.1. Introduction 12</p> <p>3.2. Sampling Locations 12</p> <p>3.3. Baseline Biomonitoring Using Benthic Macroinvertebrates 12</p> <p>3.4. Macroinvertebrate Community Structure in the Salmon River 15</p> <p>3.5. Final Selection of Monitoring Sites 18</p>

	<p>4. Tiered Approach to Volunteer Monitoring Programs 22</p> <p>4.1. Introduction 22</p> <p>4.2. Tier 1 22</p> <p>4.3. Tier 2 23</p> <p>4.4. Tier 3 23</p> <p>5. SAMPLING MACROINVERTEBRATES (TIERS 1, 2, and 3) 25</p> <p>5.1. Tier 1 and 2 Invertebrate Sampling 25</p> <p>5.2. Safety Considerations 29</p> <p>5.3. Tier 3 Invertebrate Sampling 30</p> <p>6. STREAM CHARACTERISTICS & WATER QUALITY 31</p> <p>6.1. Standard Survey for All Tiers (1-3) 31</p> <p>6.2. Additional Survey Data for Tiers 2 and 3 38</p> <p>6.2.1. Algae 38</p> <p>6.2.2. Water Chemistry 40</p> <p>7. Ensuring Data Quality 41</p> <p>7.1. Volunteer Training 42</p> <p>7.2. QA/QC Guidelines 45</p> <p>7.3. Data Management 46</p> <p>7.4. Data Interpretation 47</p> <p>8. References 49</p> <p>APPENDIX A: DATA SHEETS, INVERTEBRATE KEYS 53</p> <p>APPENDIX B: GLOSSARY OF TERMS 66</p> <p>APPENDIX C: SUGGESTED REFERENCE MATERIAL</p>
<p>Cost Evaluation Strategies for Technologies Tested Under the Environmental Technology Verification Program</p>	<p>path s:\common\WVLCtrain\usepa\USEPA-ETV-Cost Eval-600r99100 s:\common\courses\course10\ USEPA-ETV-Cost Eval-600r99100</p> <p>1. Introduction</p> <p>1.1 ETV Program Description</p> <p>1.2 Cost Evaluation Strategy</p> <p>1.3 Summary of Cost Evaluation Options</p> <p>1.3.1 No Cost Evaluation</p> <p>1.3.2 Itemization of Costs</p> <p>1.3.3 Estimation of Capital Investment and O&M Costs.</p> <p>1.3.4 Calculation of Total Annualized Cost, Simple Payback Period, or Present Value.</p> <p>1.4 Quality Assurance/Quality Control</p>

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	<p>3.7 Preparing a Cost Evaluation Report</p> <p>3.8 Reference</p> <p>4. Calculation of Total Annualized Cost, Simple Payback Period, or Present Value</p> <p>4.1 Calculating the Total Annualized Cost</p> <p>4.2 Calculating the Simple Payback Period</p> <p>4.3 Calculating the Present Value of a Technology</p> <p>4.4 Comparing Two Technologies</p> <p>4.5 Preparing a Cost Evaluation Report</p> <p>Appendices</p> <p>Appendix A: Illustration of Capital Investment/O&M Cost Estimation and Total Annualized Cost Analysis of a Dual-Stage Filtration System in a Drinking Water Plant</p> <p>Appendix B: Illustration of Capital Investment/O&M Cost Estimation and Simple Payback Period Analysis of an Electrodialysis System</p> <p>Appendix C: Illustration of Capital Investment/O&M Cost Estimation and Present Value Calculation for an Energy-Efficient Water Heater</p> <p>Appendix D: Cost Evaluation References</p> <p>Appendix E: Time Value of Money Table</p> <p>Appendix F: Unit Annualized Cost</p>
<p>Generic Verification Protocol for the Advanced Monitoring Systems Pilot – Version 1.0</p>	<p>Total pages 46</p> <p>path s:\common\WVLCtrain\usepa\USEPA-Gen Verif Protocol-prot_generalverif.pdf</p> <p>s:\common\courses\course10\ USEPA-Gen Verif Protocol-prot_generalverif.pdf</p> <p>1. INTRODUCTION</p> <p>2. PATHWAY TO A VERIFICATION TEST</p> <p>2.1 Priority Technology Needs</p> <p>2.2 Request for Technology</p> <p>2.3 Application Package</p> <p>2.4 Vendor Meeting</p> <p>2.5 Verification Agreement</p> <p>2.6 Test/QA Plan</p> <p>3. GENERAL DESCRIPTION OF A VERIFICATION TEST</p> <p>3.1 Technologies Tested</p>

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