Practice Standards

Assessment, Remediation and Management of Contaminated Land

The Contaminated Lands - Assessment, Remediation and Management practice area involves activities related to identifying, assessing, managing and remediating contaminants found within environmental media to facilitate the return of a site to a desired end land use. It is a multidiscipline area of practice that includes recognizing, sampling and delineating contaminated environmental media and developing site management plans. Practitioner activities may include recommending and implementing appropriate remediation strategies and technologies based on site and contaminant characteristics, exposure pathways and risk management that consider both human and ecological health. Competent practitioners are fully conversant with relevant legislation, standards, directives and guidelines and provide ethical recommendations to their clients based upon sound scientific principles.

This PA does not include Land Reclamation. Land reclamation is the stabilization, contouring, maintenance, conditioning, reconstruction or revegetation of the land surface to a state that permanently renders the land with a capability equivalent to its pre-disturbed state or for an alternate designated land use. Whether reclamation is required on contaminated lands after remediation or risk management is dependent upon the desired land use. Land reclamation is required for all mandatory activities defined in the Environmental Protection and Enhancement Act (EPEA) and in areas where the final land use requires a soil growth media for revegetation.

The main activities, outlined below, involved in this PA include:

- Understanding Drivers and Planning
- Phase 1 Environmental Site Assessments (ESA)
- Phase 2 ESA
- Remediation
- Risk Assessment
- Exposure Control (Risk Management)
- Validation and Closure

Crop Production

The Crop Production practice area involves a multidisciplinary and integrated approach to managing land producing agricultural crops to ensure the long-term sustainability of our food production systems. This involves understanding and applying principles of agronomic best management practices, farm business management and economics, and environmental quality management. Practitioners make decisions that operate over a variety of time scales from immediate problem solving related to seasonal crop performance, to multi-year crop rotation planning. The practice area occurs within a rapidly evolving industry that demands practitioners stay current with new research, technologies and regulations. Practitioners provide validation of new information and play an important role in extending that information to producers by providing advice and receiving feedback on effectiveness of crop production strategies and recommendations. Practitioners may be involved in several specific crop production activities that include nutrient management; insect, weed and disease management; crop rotation development and implementation; soil conservation; water quality management; harvest management and grain storage; and, technology and equipment management. Practitioners may also be involved directly or indirectly in crop breeding and applied research trials to assist in varietal selection for specified geographic regions.

The Crop Production practice area can be grouped into four focus areas which vary by crop type: annual crops, perennial crops, agroforestry and horticulture. Annual crop management focuses on

cereals, oilseeds, pulses and special crops (e.g., sugar beets) and annual forages while perennial crop management focuses on perennial forage as hay and fodder for animal feed and for forage seed production. Please refer to the Rangeland and Pasture Management Practice Standard for management of perennial forages in a pasture grazing system. Agroforestry focuses on tree management and the production of wood and fiber in a woodlot setting as opposed to large forest management areas. Horticulture focuses on production of fruit and vegetables along with ornamental species of plants.

Environmental Monitoring

The Environmental Monitoring practice area of the Agrology profession focuses on evaluating environmental media and conditions while working toward compliance of human activities with environmental standards and guidelines. Professional Agrologists and Registered Technologists in Agrology bring their knowledge of environmental media (soils, vegetation, water) and the interaction of the various media to the practice of environmental monitoring. The work conducted by agrologists involves managing and monitoring the effect of human activities to minimize environmental impacts. This includes development and implementation of scientifically defensible processes and protocols for evaluating environmental media to establish conditions prior to, during and after development. Agrologists provide interpretation of data and direction to projects to derive mitigation strategies and suggest proper courses of action for various types of development. Work involves safely collecting and handling representative samples; analysis of environmental media (e.g. soils, vegetation, water); data analysis and interpretation; accurate reporting and on-site project supervision. The work is often closely linked to environmental legislation and operational approvals for several types of commercial and industrial developments. Agrologists who work within this practice area play a vital role in fulfilling the environmental monitoring requirements of development approvals as well as ensuring environmental protection plans are being followed. Agrologists may work for consulting companies, industrial firms, government regulatory agencies, non-governmental environmental agencies, or educational institutions. The work involved in the Environmental Monitoring practice area consists primarily of the following core activities:

- Baseline Establishment
- Construction Monitoring
- Operations Monitoring
- Post-operations Monitoring

Greenhouse Gas Assessment and Management (Agricultural)

This Greenhouse Gas Assessment and Management practice area involves a number of scientific disciplines related to documenting and assessing sources and sinks of greenhouse gases for cropping systems. Some member activities include evaluating farm gate greenhouse gas sources and sinks; development of sampling plans to monitor and verify success of C-sequestration in agricultural and non-agricultural soils; evaluation of wetland sources and sinks; devising of management strategies to reduce greenhouse gas emissions; ISO 16064-3 audit principles; evidence relevant for the “Quantification Protocol for Conservation Cropping” (CCP) as well as development and implementation of the 4R Plan for the “Quantification Protocol for Nitrous Oxide Emissions Reduction” (NERP). The work involved in GGAM can be grouped into eight categories which include

- Legislation, Regulation and Associated Technical Guidance
- Protocol Awareness
- Compliance data collection and management
- Work with a verification team
- Field Assessment Skills
- Analyze and interpret field and laboratory data

- Communications/Problem Solving
- Report writing

Land Conservation and Management
This Practice Area involves disciplines such as economics, landscape pedology, soil chemistry and fertility, physical geography, and agronomy. Some member activities include land capability classification, development of conservation plans, regional and municipal land use planning, policy and program development. This practice area involves disciplines such as soil science, landscape pedology, agronomy and vegetation ecology. Some member activities include conducting biophysical inventories for soil salvage and conservation operations; development of soil replacement plans; site reclamation plans; preparing conservation and reclamation reports as required under the Environmental Protection and Enhancement Act.

Land Reclamation
The Land Reclamation practice area is a multidisciplinary practice that involves understanding site characteristics, desired land use outcomes and stakeholder considerations with the objective of developing a functional predetermined end land use. Land reclamation involves developing and implementing a reclamation plan that considers and integrates logistical, management and biophysical considerations. Execution of a reclamation plan may include site contouring for landscape drainage and stability; soil replacement and/or treatment; revegetation; weed and herbivore management; and contractor supervision and management. Reclamation monitoring provides feedback so that appropriate adaptive site management activities can be implemented. Detailed site assessments are required for verification that reclamation objectives have been met when site closure is required. Land reclamation practitioners are knowledgeable of relevant regulatory requirements and provide competent and ethical recommendations to stakeholders based on sound scientific principles, experience and economic considerations.
Land reclamation may be required on lands that have been subjected to various disturbances that may include contamination. The Land Reclamation practice area does not include activities related to assessment, management and remediation of contaminated land (e.g. Phase 1 Environmental Site Assessment, Phase 2 Environmental Site Assessment, Remediation, Risk Assessment and Risk Management). Where land disturbance has included contamination, land reclamation usually follows the completion of remedial activities.
The work involved in land reclamation can be grouped into four main categories which include:

- Understanding drivers and project planning.
- Project execution.
- Monitoring.
- Verification.

Livestock Production
Agrologists with the Livestock Production PA provide professional advice to producers, government, industry and other organizations on the appropriate management of livestock to produce food, fiber and other value-added products. The sustainability of the livestock production industry is at the forefront of the work these Agrologists perform with focus and leadership on animal performance, health and welfare, environmental stewardship and protection, food quantity and quality, and economic profitability. Livestock Production Agrologists must be knowledgeable of emerging technologies related to genomics, data analytics, remote sensing and smart/precision farming. In order to integrate these innovative technologies into a sustainable production system, Livestock Production Agrologists are continuously upgrading their training and skillsets.

Agrologists within the Livestock Production PA work closely with the Veterinary Medicine

profession when it comes to animal health and welfare (within the realm of disease and pathology); and, with the Engineering profession with respect to identifying, developing and constructing the infrastructure needs of an animal production enterprise. Livestock Production Agrologists also may confer with Agrologists working within the Crop Production and Rangeland and Pasture Management PA's to ensure the feed or forage meets the ingredient, nutrition, quality and quantity requirements of the animal. Livestock Production Agrologists similarly may work alongside Agrologists in the Food Development and Processing and Regulatory Support PA's to address product quality issues, food safety, novel food (meat) development, traceability and import/export standards. In addition, Agrologists within the Livestock Production PA may consult with Agrologists working within the Water Resources Planning and Management PA, Land Conservation and Management PA and the Biosystems, Biosolids, Compost and Manure Management PA to ensure land is conserved and water quality and quantity needs are met as well as addressing any environmental quality issues that may arise related to manure and waste management associated with livestock production.

The livestock industry continues to undergo increased scrutiny from the general public and special interest groups opposed to animal agriculture. Agrologists play a key role in educating the public regarding the state of the livestock industry and the practices that have been implemented to ensure animal health and welfare meet societal expectations. All Livestock Production Agrologists are involved in public education to one degree or another. They educate the public or those involved in agriculture either informally through conversations and other interactions or formally by teaching animal science and conducting or managing research within an institutional setting in Alberta, Canada or internationally. Each year these institutions graduate animal scientists and technologists who become the next generation of livestock production specialists.

Agrologists are at the front line of adapting academic research and finding ways to implement and transfer new technologies to an ever-changing industry. The development of new technologies in the livestock industry is rapidly increasing the technical requirements for Agrologists to assess the benefits and consequences of implementing these technologies. Practitioners within the Livestock Production PA participate in a variety of core activities within the PA. These activities include animal health and welfare; nutrition and feeding; genetics and breeding; economics and markets; product quality and safety; regulatory and codes of practice, environmental management and infrastructure development.

Management

Management is a process of effectively achieving organizational objectives through the efficient use of resources in a changing work environment and marketplace. It employs a set of time-proven principles in the functions of planning, organizing, leading and evaluating. Effective management applies these principles in utilizing physical, financial, human and informational resources efficiently and effectively to achieve organizational goals and social/environmental outcomes. Agrologists provide management leadership in life sciences, environment, agriculture and food. Members involved in the Management practice area are responsible for ensuring that economic, social and environmental outcomes are consistent with organizational objectives as well as professional and ethical objectives of the agrology profession. Competent management is critical and will involve both analytical and soft skills.

Management is accomplished by managers who decide on, coordinate and allocate resources with work activities so that they are completed efficiently and effectively with and through other people. Managers in the profession of agrology play a vital part of providing direction and guidance to the practice of Agrology. They also play a key role in shaping a professional's

career and determining what and how work is to be conducted. A manager is responsible to work with and through people to coordinate their work activities to accomplish organizational goals. Ultimately, the responsibility and accountability for a team's performance falls on the shoulders of the manager. Managers generally are involved in five management functions: planning, organizing, leading, evaluating and developing people to accomplish objectives. Members working within the Management practice area of the Agrology profession generally are involved in one or more of the following components of management,

- Strategic
- Operational
- Human Resources
- Technical
- Project
- Marketing and Sales
- Advocacy and Public Relations

Rangeland and Pasture Management

The Rangeland and Pasture Management practice area (PA) is an integrated and multidisciplinary practice area based on ecological, agronomic, and socio-economic principles to manage rangeland and pastures in a sustainable or regenerative manner. Rangelands are areas of naturalized vegetation that support herbivores and are managed for multiple uses and or values. Rangeland is a type of land not suitable for cultivation of intense agricultural production, having inherent restrictions such as soil moisture, soil nutrients, soil temperature, soil texture, topography, etc., that limit productive capabilities. Rangeland can be grassland, shrubland, or forest, native or introduced species, and can be of value to society for production or ecological reasons. Pasture land is similar to rangeland, but with fewer production restrictions. By the nature of the land itself, pasture tends to be used more for perennial forage production in a grazing system.

The effects and outcomes of management decisions in this PA are assessed over a long-term time horizon that spans multiple decades. This PA focuses on land that supports perennial vegetation used within a grazing system (i.e., rangeland plant communities, forest, tame pasture) rather than cropped land used for production of annual or perennial forage for hay, fodder and seed production. Please refer to the Crop Development Practice Standard regarding hay, fodder and forage seed production.

Water Resources Planning and Management

Agrologists traditionally have focused on agricultural land use and its importance to agricultural production and this continues to be a major focus of Agrologists working in this practice area. In addition, the expertise of Agrologists is valuable to sustainable water resource management in a variety of other land use practices and may participate in flood forecasting, climatology, channel morphology, water quality, environmental flows, water approvals, etc.

Agrologists who work directly with water resources play a vital role in safeguarding both water quality and water quantity for all Albertans. As stewards of water resources, Agrologists play important roles in advising and educating users of this valuable resource. Agrologists working in this PA may be found working for government, industry, consulting, non-governmental and non-profit organizations. The common thread among these professionals is overseeing the wise use of water for the many competing uses of this resource, and understanding the potential impacts from, or interactions with or among, the diversity of land uses in Alberta.

The primary roles of Agrologists within this PA fall under the general titles of assessment, planning, stewardship and education. Each of these roles comprise portions of specific core activities within the PA including (i) watershed condition (health) assessment; (ii) development of

watershed management plans; (iii) management of sustainable water supplies for various uses including agriculture, domestic supply, recreation, environmental flow needs (e.g. fisheries and aquatic life, wildlife habitat, etc.); (iii) policy development and regulatory requirements; (iv) education and improvement of water literacy; (vi) applied research.
Agrologists working within the Water Resources Planning and Management PA may provide professional support to Agrologists who are lead professionals within the Wetland and Riparian Area PA and/or those leading work within the Environmental Monitoring PA. Some Agrologists may be specialists in Water Resources Planning and Management, Wetland and Riparian Areas and Environmental Monitoring PAs as there is significant overlap of knowledge and skills among these three PAs.

Wetland and Riparian Areas
Wetland science, design, and engineering are interdisciplinary in nature but are necessarily brought together by the requirements of the Alberta Wetland Policy. Broad descriptions of each individual component of this *Practice Area* are provided here.
Wetland Science
Wetland science deals with the physical, chemical, and biological properties of wetland ecosystems. In the context of the Alberta Wetland Policy, the professional seeks to understand the functionality of wetlands and how human and natural activities influence a wetland's ecological condition.
Wetland Design
Wetland design is the *practice* of creating wetland systems that are as to near self-sustaining as possible, within the constraints and opportunities of its catchment and surrounding human and natural environments. The final design must combine considerations from a broad array of scientific and technical disciplines to devise a wetland system that meets desired outcomes. It is the fusion of creative and technical disciplines that distinguishes wetland engineering and design from wetland science.
Wetland Engineering
The practice of engineering means reporting on, advising on, evaluating, designing, and preparing plans and specifications for or directing the construction, technical inspection, maintenance, or operation of engineered structures, works, or processes For the purposes of this document, engineering refers to wetland engineering.

Practice Areas

Agricultural Marketing and Sales
This Practice Area involves the marketing and sale of agricultural products and services such as buildings, structures, machinery, equipment, crop nutrients (fertilizer) and crop inputs (seed, pesticides) to assist those managing the land. Members involved within this Practice Area are generally employed with agricultural businesses and are focused on the business side of production agriculture. Additionally, they may be involved in services related to negotiating land agreements and leases due their understanding of land use, land economics, agricultural production systems and negotiating skills. They work closely with agronomic specialists to ensure their clientele's sales and production needs are met.

Agricultural and Natural Resource Economics
This Practice Area involves disciplines such as economics, marketing and global trade. Some member activities include policy, trade and economic analysis with government, banking and industry. Some members are involved with research and teaching with various universities and

colleges. This Practice Area includes all interfaces between agriculture and financial institutions involved in lending of funds for the various activities of the agricultural industry. It includes the management of lending portfolios for producers, agri-business and agri-food operations. It also involves studying the effects that changes in national economic policies have upon the economic performance of agriculture and the financial position of farm operator families and businesses. There can be a focus on the supply, demand and allocation of natural resources within the greater economy and how ecological constraints influence economic activity. Natural resource economics bridges the natural and social sciences. Some member activities include participation in environmental impact assessments, policy development, and feasibility studies.

Biophysical Classification and Evaluation

This Practice Area involves disciplines such as vegetation ecology, landscape pedology, soil and vegetation taxonomy. Some member activities include field surveys for ecosite evaluation, determination of soil nutrient and moisture regimes, soil profile classification, aerial photograph interpretation, and ecosite mapping. These activities are often conducted in association with baseline studies for environmental impact assessment. This Practice Area involves disciplines such as landscape pedology, surficial geology, surface and subsurface hydrology and vegetation ecology. Some member activities include biophysical inventories of soil resources for environmental baseline studies and impact assessments, aerial photograph interpretation, modeling of soil and terrain relationships and documentation of these relationships for land evaluation purposes, determination of soil sensitivity to acid deposition, evaluation of soil and land capability for various land uses. Members involved in this Practice Area provide primary data for development of conservation and reclamation plans as required under the Environmental Protection and Enhancement Act.

Biosystems, Biosolids, Compost and Manure Management

This Practice Area involves disciplines such as biochemistry, microbiology, soil chemistry and fertility. Some member activities include management of various agricultural, industrial and municipal waste streams; development of land application plans of various waste products (i.e. manures, biosolids); monitoring and assessment of soil chemical, physical and biological properties; compost development and management; odor control; policy and program development. This Practice Area involves the undertaking of agricultural design and advising on the use of buildings, structures, machinery and equipment. In addition to this, the development, management and use of waste treatment and ecological systems also fall within this Practice Area.

Environmental Impact Assessment and Mitigation Planning

This Practice Area is multi-disciplinary in nature and involves documenting baseline environmental conditions, assessment of potential project effects as well as cumulative effects on the environment. Recommendation of mitigation strategies to minimize or negate potential or cumulative effects is provided. Members involved in this Practice Area participate as part of large multi-disciplinary teams who provide expertise so that regulatory authorities can make informed approval decisions regarding proposed industrial developments. This Practice Area focuses on the development, implementation, management, monitoring and auditing of a systematic documented environmental protection system for a particular organization. It includes such activities as identifying potential environmental impacts related to an organization's day-to-day functions, development of goals and objectives for environmental protection, development of implementation strategies and training programs for staff. Compliance monitoring and auditing are also part of an environmental management system.

Food Development and Processing

This Practice Area involves disciplines such as food biochemistry and microbiology, and processing chemistry. Some member activities include development and application of new technologies; the development of new and improved food products and processes; marketplace research and testing. This practice area focuses on the policies and regulatory frameworks that identify, analyze and manage the risks associated with the safety and security of our food supply systems. This includes assessment of food safety and security risk through the pre-harvest and pre-slaughter stage through processing, distribution and consumption stages.

Regulatory Support and Consultation

This Practice Area is common to the Life Sciences, Environment, Agriculture and Food Sectors. The agrology profession operates within a regulatory environment and many members have expertise in legislation and regulatory requirements. Regulatory support for clients includes consultation in support of development applications and approvals required under legislation such as the Water Act, Environmental Protection and Enhancement Act, Agricultural Operations and Practices Act. Members may be involved in environmental impact assessments, pre- disturbance assessments, development of conservation and reclamation plans, reclamation certificate acquisition, public hearings and open houses.

Rural Development and Support

This Practice Area involves disciplines such as rural sociology, psychology and economics. Some member activities include policy and program development, community economic development, family studies, and a variety of social services. Members seek to enhance the quality of rural life, communities and the environment. This practice area is common to the Life Sciences, Environment, Agriculture and Food Sectors. Members involved in this Practice Area are directly involved in education rather than applied practice. Members may be involved in classroom education or long-distance education associated with a variety of universities and colleges within Alberta. In addition, members may be involved in extension activities and information dissemination to government and/or industry personnel, landowners and primary producers.